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THE ARCTIC SLEDGING JOURNALS.

[An unavoidable injury has been done to the Arctic Expedition by the long delay in making the journals of the extended sledging parties accessible. Their perusal will give some idea of the hardships and sufferings that were cheerfully encountered in order to secure success. We have pleasure in publishing the following review of the sledging journals by an old and distinguished Arctic officer of great sledging experience, who served in two expeditions and passed three winters in the ice. The testimony of such an authority as to the exceptional difficulties encountered in 1876, and as to the splendid work of officers and men during the late expedition, far more than counterbalances all the shameful attempts at detraction which have disgraced the columns of a portion of the English press. Detraction (with one notorious exception) comes from ignorant stayers at home—generous and hearty appreciation comes from men who have done similar work and who know what it is.]

On the return of the late Arctic Expedition, in common with most old Arctics, I was very much surprised at the unprecedented attack of scurvy, from which very few indeed of the crew appear to have escaped scatheless, and which, by shortening the sledge journeys, has diminished the geographical results we should otherwise have obtained. It is not my intention to discuss the question of lime-juice for the sledge parties, beyond observing it was not previously customary to carry it; and as none of the earlier parties broke down, I cannot conceive it possible that men who left the ship in sound health would be completely prostrated in twelve days, as happened with some of Commander Markham's party—in sixteen days with one of Lieut. Beaumont's—owing to the want of lime-juice, and all three extended parties brought to the verge of destruction in two months. In point of fact, scurvy in sledge journeys was never anticipated, as is shown by the absence of any mention of it or its premonitory symptoms in the directions drawn up for the use of officers commanding sledge parties, by the able medical officers of previous expeditions, amongst them being the present Medical Director-General of the Navy.

Nor do the officers of the late expedition, who had carefully studied the journals of their predecessors, appear to have anticipated it—Commander Markham remarking, May 2nd (30 days out), "the invalids are not improving, and we are inclined to believe they are all attacked with scurvy, although we have not been led to suppose that there is any probability of our being so afflicted, and are ignorant of the symptoms." Lieutenant Beaumont, May 7th, suspects a state of scurvy, and remarks: "I had no reason to expect it—indeed, I never thought of it." The health of Lieut. Aldrich's party remained good till April 30th, when, with the exception of two, they rapidly became scurvy-stricken, although they did not consider it so till on their return journey.

In regard to the extended parties of earlier expeditions, I find Lieutenant Osborn observes of himself, May 28th (1853): "I have been unwell all day, and I am still weak and feverish, occasioned by the state of my right leg, which now shows symptoms of erysipelas or scurvy, which of the two I am not doctor enough to tell." And even as late as June 19th, when Simon Dix was evidently (from my present knowledge) suffering from scurvy, Osborn does not mention the word, but on the 26th September, in a letter to Sir E. Belcher, he says: "About this time (June 18th) a disease, which assumed, as far as I can judge, the appearance of scurvy, showed in my party, Simon Dix and myself being the sufferers." He had then probably obtained a medical opinion.

Captain Kellett reports to Sir E. Belcher, February 10th, 1854: "Lieutenant Mechan arrived July 6th (1853), having been absent ninety-four days, his party all well, with the exception of one man, who has lost, I fear, the sight of one eye. Commander McClintock returned July 18th, after an absence of 105 days; he walked in with his crew all safe and well." The thaw had compelled the abandonment of sledge on the north shore of Melville Island, 40′ from the ship.

These facts will, I think, prove that the officers of the late expedition had no reason to anticipate scurvy on the sledge journeys, judging from past experience.

The short distance made by the recent sledge parties, in comparison with their predecessors, also surprised me very much, when I had only Captain Nares' report and the chart showing the sledge journeys to judge by, and I confess to thinking *we* should have done better. No unbiassed person, however, can read the modest matter-of-fact journals of the three officers commanding the extended sledging parties and retain that opinion. Nothing as yet published gives an idea of the tremendous obstacles Commander Markham and Lieutenant Beaumont experienced from hummocks of ice, of all sizes, up to 40 and 50 feet in height; soft snow up to the waist, or, worse still, half-thawed, with a frozen upper crust, which would partly bear the weight of the body, and then down you would go with a jerk thigh deep. No sledge parties of which I have

any knowledge ever encountered such difficulties. Lieutenant Aldrich's great obstacle was from soft snow, in other respects he appeared to have experienced much the same travelling as Kellett's parties. When it is considered, in addition, nearly all the crew were scurvy-stricken, and half had to be dragged on the sledges by their fellow-sufferers, little better than themselves, and not knowing how soon they would collapse, we may thank God for the preservation of these parties, who were all literally on the verge of destruction; as it is, we have to mourn the loss of three poor fellows who died on the journey. Extracts from the journals will speak more eloquently than any words of mine.

Commander Markham left the 'Alert' on April 3rd, 1876, after filling up with provisions from the depôt at Cape Joseph Henry; he was to push out due north into the Polar pack, and attain as high a northern latitude as he could effect. As it was uncertain when the ice on the offing would break up, this party dragged two boats in addition to their equipment and provisions—hence the two sledge parties had three sledges to drag. The two smaller sledges were first taken on, the whole party then returned and drew on the larger sledge; so that for every mile made good, where travelling was fair, the men had to drag the sledges two miles, and one mile was walked, and in soft snow and among hummocks it was as bad as dragging, the support afforded by the belt being lost. As the men broke down and were unable to drag, or compelled to be carried, it was necessary to make three, four, or five journeys, the loaded sledges being drawn three, four, or five miles, and the unloaded two, three, or four miles to make good one mile. In seventy-two days' absence they made good 168 statute miles, going over 600 miles to accomplish it. Judging from the journal, I consider the loaded sledges were actually dragged half the difference between made good and travelled in addition, or $168+216=384$ miles, the other 216 being done by unloaded sledges returning for another load or by walking back to drag on a loaded sledge.

The nature of the obstacles is best given in Commander Markham's words:—April 11th, "The floes are small but very heavy; they appear to have had a terrible conflict with one another, the result being what we are now encountering, viz., a great expanse of hummocks varying in height from 20 feet to small, round, nobbly pieces, over which we stagger and fall. Between these hummocks the snow-drifts are very deep, and we are continually floundering up to our waists, but the men struggle bravely on." Again, April 15th, "These hummocks consist of large fragments of ice, squeezed up into every indescribable shape and form, varying from 15 to 25 feet in height; so thickly compacted together are these huge masses of ice that they appear to form an impenetrable barrier to our advance, but by dint of energy and perseverance our road-makers soon succeeded in overcoming them. Some of the floes are far thicker than others, and it is of no unfrequent occurrence that we have to lower the sledges a distance of 6 or 7 feet from the top of one to the surface of another, and *vice versâ*." This sort of work continued throughout the journey, varied by Palæocrystic floe, of which he remarks: "We seem to have got quite away from smooth, level floes, surrounded by dense hummocks, and have reached floes of gigantic thickness, with most uneven surface and covered with deep snow." On the 19th, having only advanced 300 yards in 3½ hours, the 20-feet ice-boat is abandoned; "at 7 P.M. we arrived on some young ice between the floes, on which we rattled gaily along, accomplishing half a mile in something like two hours, good work for us;" but only a mile was made good in the day, for 8 marched.

I do not remember in 114 days travelling with men, and 50 days with dogs, during my Arctic career, doing less than 3 miles a day, more than four or five times. The Commander is grateful for small mercies. Suppose two columns of railway trains charge one another, and the interstices of the *débris* filled with soft snow, over which the sledge has to be dragged, and the uninitiated may get some faint idea of the nature of the work. Lieutenant Parr and a party generally commenced the day's work by forming a practicable road for the sledges to follow. Commander remarks, "Parr working like a horse . . . . a slave . . . . a labourer."

This work is continued for forty days; and to add to their labours, the first case, of what we now know to be scurvy, occurred on the eleventh day out, and another next day, both too ill to walk, and had to be dragged on the sledge, adding materially to the weight, while diminishing the motive power 12 per cent. As a rule, they were carried for the remaining sixty days of the journey. By the 3rd May, they had five invalids "utterly helpless and therefore useless." 4th, "More of the men are complaining of stiffness and pain in the legs, which we fear are only premonitory symptoms" (*i.e.*, of scurvy). On the 7th, five men were on the sledges. On the 9th, the Commander reluctantly comes to the conclusion that aggravated scurvy is the complaint, describing his party as follows:—"Porter worse, complains of pain in the chest, mustard plaster applied; he has to be revived occasionally with spirits of ammonia. Hawkins' face breaking out with boils and sores, and his gums are affected. Shirley suffers from faintings. . . . . Indeed, this is a general complaint with all the sick . . . . who have even to be carried from the tent to sledge and back again." The duty of attending the sufferers is harassing to both officers and men, although willingly and cheerfully performed. Four other men were also complaining.

May 11th, they pitch their most northern camp. "Two of the invalids feeling strong" attempt to walk; one faints altogether, the other almost does so. They sounded in 72 fathoms, bringing up specimens from the bottom, the temperature of the surface water being 28°·5 Fahr. to 30 fathoms down, then 28°·8 to the bottom. Next day the invalids are left in the tent, the officers and remainder of party start after breakfast to walk north. After "struggling up to their waists in soft snow" for three hours, although unencumbered, they only got 1½′ from their encampment. The flags and banners are displayed in the highest latitude as yet attained by man, 83° 20′ 26″ N., or half-a-mile less than 400′ from the Pole. "Three cheers were given, and one more for Captain Nares; then the whole party, in the exuberance of their *spirits!!* sang the 'Union Jack of Old England' (never was its honour more worthily upheld), 'the grand Palæocrystic sledging-chorus,' winding up with 'God save the the Queen.'"

Returning to the sledge, a magnum of whiskey, pre-

sented by the Dean of Dundee, to be drank in the most northern latitude, was partaken of by the party. A hare, shot by Moss, and kept for the occasion, gave them a sumptuous supper. The evening was wound up by songs, in which even the invalids joined. "All seemed cheerful, happy, and contented" is the most northern remark made in the journal.

The return journey commenced May 13th, following their outward track, the work being much the same, aggravated by men getting weaker and losing appetite. May 16th, "At breakfast, in one tent, scarcely a pannikin of pemmican was eaten" by eight men, the allowance being a pannikin apiece; and I find in my own journal, after fifty days' absence, remarking on its insufficiency, and for the first three weeks they were "ravenous, and could have eaten an extra pannikin at supper." They also suffered from thirst, which may appear curious, surrounded as they were by ice and snow, but fuel could not be spared to melt it, and eating it only aggravates thirst. On the 17th they abandoned the other boat, trusting there may have been no disruption of the ice, their only hope being to get into the land as quickly as possible. The invalids getting weaker and unable to dress or undress themselves, fainting at times. Snow, soft, and deep. Hummocks very high; one measured by aneroid was over 50 feet high. The whole party were in fact getting weaker. On the 25th, "Out of thirty-four legs in the whole party only eleven are sound, even some of these are shaky." On the 28th only the two officers are intact, and judging from their small appetites, I should doubt even that. May 31st, "We are a perfect band of cripples." June 2nd, "Five men are carried, four can just hobble along, the remaining six men being very shaky. . . . . It is absolutely painful to witness the poor fellows hobbling along, yet doing their utmost to be cheerful," and this with "snow in places up to our waists, and very wet between hummocks, our foot gear being literally soaking" from sludge and ice-cold water. June 4th, reached the depôt at Cape Joseph Henry, finding Captain Nares and a party had only left it the preceding day. Three hares, however, had been left for them, on which they fared sumptuously, and with news and letters cheered them up a little. On the 6th June, the "only chance of saving life is by receiving succour as soon as possible. Although the distance from the ship is nearly 40 miles, over floes covered with deep snow, and girt by heavy hummocks, Parr has nobly volunteered to attempt it, and has confidence in being able to accomplish it." He started 8 P.M. 7th, and arrived on board next evening about the same time (quite done up and hardly able to speak). Every available man and officer under the Captain immediately proceeded to the rescue, preceded by Dr. Moss, Lieutenant May, and the dog-sledge, who met the sufferers 11 P.M. of the 9th—alas! too late to save the life of G. Porter, R.M., who had died noon 8th from exhaustion brought on by his long sufferings. I need scarcely say the invalids cheered up with the arrival of succour, and they arrived on board the 'Alert' 1·30 A.M. June 14th. Of the original party of fifteen men, only three could drag the sledge alongside, the remainder being carried on the relief sledges. They were seventy-four days absent, making good 73 miles on the outward journey and 71 homeward, or 144 miles made good for 608 statute miles marched = 8·4 miles a day, and although the sledges only made good on an average 2 or 2·3 miles, they were actually dragged, as near as I can calculate, about 5 to 5·4 miles a day.

The western party of two sledges, under Lieutenants Aldrich and Giffard, left the ship on April 3rd, keeping company with the Polar party till both left Cape Joseph Henry. The great difficulty they experienced was from soft snow, in which "the sledge sinks until brought up by the sledge-bottom, which presses hard on the soft surface of the snow," compelling resort to double banking and half-loads; in twenty-eight journeys during the month of April only two were exceptions, the first and last.

April 25th, Lieutenant Giffard parts company, leaving them now alone; up to this time, with the exception of the first few days, the crew had been in good health. On that day, although Lieutenant Giffard's crew assists in dragging their sledge for 6½ hours, owing to "deep, soft snow," the sledge frequently came to a stop, and the distance made good was only 3¼ miles, and would of course have been only half that distance with the single crew. Further on is the observation, "The double journeys are most discouraging to the men, and their looks of disappointment, when, after nine hours' labour, they find themselves only 2½ to 3 miles from where they started, show how much they would do if they could." The measured rate of advance was 1400 yards an hour, which, "when divided by three for bringing up the second load, gives our actual progress at about a quarter-of-a-mile an hour." Crossed 83rd parallel April 28th. On the 30th, the Serjeant's leg looks very ugly, and although "appetites are good, the full allowance is not eaten except by a few of us," showing to me scurvy was commencing its insidious attacks. May 2nd, having left a depôt, start with 30 days' provisions, travelling and making good 9⅔ miles. 5th, "Serjeant's leg not improving," or men's appetites. "The soft, deep snow through which we advanced by standing pulls, or very few yards without one, was crusted over in such a manner as just not to bear you, but let you in suddenly up to your knees, and rendered the extrication of your feet somewhat difficult unless pulled out exactly as they had broken through," just as Beaumont describes his work. On 7th, "Health good, except stiff legs"—two of the men's legs "swollen and puffy looking." On 10th, Stiff and puffy legs defy all medical skill, unable to bandage, as "slightest pressure of the finger leaves a dent, which remains a considerable time;" and although strictest orders are given against "tight lacing" . . . . "I find the loosest moccasin-string cuts an ugly red-looking mark." It seems curious that it was not then considered scurvy. Lieutenants Aldrich and Ayles being the only two who eat all their pemmican, the others gradually going down hill, and becoming dispirited, "lamenting the wretched state of legs, and fearing their work will not bear comparison with the other sledges, *and those who have gone before us*," and the latter fear appears to be common to all the parties.

On the 16th, Aldrich and Ayles have to walk back for the pickaxe left at the last encampment; on their return nearly losing themselves, a gale of wind having sprung up, and a heavy snow-drift obliterating the sledge tracks, but fortunately found the tent after fourteen hours' absence, glad to get tea and pemmican, "fully appreciating the comforts of our Arctic tent," instead of camping on the floe for the night. On the

18th their extreme was reached, latitude 82° 16′ N., longitude 85° 33′ W., furthest land seen being in 86° 30′ W. longitude. May 21st, temperature in tent 57°, "horribly warm" is a note to the information. 22nd, visited by a snow-bunting. The Mayor and Corporation of Portsmouth were toasted, "the men remembering with many queer and pointed remarks the very satisfactory manner they were entertained this day last year. Mitchell and Ayles are the only two sound men left." As with the other parties, Her Majesty's birthday was not forgotten.

In consequence of the scurvy they were unable to make as long marches as on the outward journey, and have to go on short allowance till the depôt was reached, June 7th, when "they revelled in biscuit and luxury;" the latter, as I glean from the journal, being sugar and potato (preserved), and cocoa. The medical inspection, June 3rd, was—two men unable to drag at the sledge; one, very bad leg; three, bad legs and other complaints. "Ayles perfectly sound." Doidge asked, "Is scurvy ever got while sledging"? Although he was answered "No," from this date the men, however, knew what was the matter. The work of dragging now fell almost entirely on Ayles and his officer, fainting occasionally being an additional trouble. On the 12th, another depôt is reached with lime-juice in it, probably sent from the ship. On the 19th, the Serjeant was put on the sledge. They came to View Point at 7 A.M. of the 20th, and as it was evident they could not reach the ship without assistance, Ayles, like Parr with the Commander's party, volunteered to walk in to procure it. "There's a silvery lining to every cloud," "and never did one appear so welcome as that which came in the form of a shout from the hill above View Point and the discharge of a gun," which came from Lieutenant May, who had been sent to their aid by Captain Nares on the return of the Commander's party. The luxuries this time were ox cheek, apple jelly, oyster and egg flip, on which the party regaled much to their satisfaction. "Two men fainted on the 22nd, and Doidge had to be put on the sledge; even Ayles showed his first sign of weakness of limb." They reached the ship just after midnight on the 25th June, having been assisted by a party from the ship. "Ayles and Mitchell" were the only two men of the party "in the drag ropes, the latter allowed to totter alongside in the belt, assisted by the Commander, in consideration of his own request," game to the last.

This party was eighty-four days absent, having made good 455 miles, but marched 635 miles—the sledges, I calculate, having been dragged 545. The daily average in statute miles being made good, 6·3; marched, 8·8; sledge drawn, 7·45.

Lieutenant Beaumont left the 'Discovery' on April 6th, and reached the 'Alert' at 10 A.M. on the 16th, from whence he made his final start on the 20th to cross Robeson Channel and explore the North Coast of Greenland. The journey up from the 'Discovery' was very good preliminary training for his crews, as their loads were light, 150 lbs. a man. He, therefore, commenced his journey under much more favourable circumstances than the other two parties, being exposed to a brief period of extreme cold in comparison, besides the preliminary training. The work was heavy crossing the channel, but not as hard as that experienced by the Polar party, as he travelled about 6 miles a journey, making good 4½.

By 11.30 p.m., 27th, they reached the shore of North Greenland, J. J. Hand, A.B., being the first to plant the Union-Jack on it. Poor fellow, he was also the first attacked by scurvy, and the first of the sledge parties who died from it and the work. The heavy hummocks made by the pressure of the Polar pack against the shore, varying from 10 to 40 or 50 ft. in height, required the pickaxes to be kept constantly going to form a road, or the gaps had to be bridged over, and when this became impossible they had to take to the steep snow-slopes on the land. Beaumont remarks: "Very slow work and trying to the temper, for it was difficult to stand, much more drag the sledges; they slid down more than we could drag them along, so that every now and then it was necessary to have standing pulls up the hill, to prevent them going over the edge of the slope." As may well be imagined, when some of the slopes were ascertained by Dr. Coppinger to vary from 20° to 24° by clinometer, "hard and slippery."

On the 3rd May the distance travelled was, I see, 5½ miles, but only half-a-mile was made good—decidedly "slow and trying to the temper"—after four hours' marching and six road-making. On the 4th Dr. Coppinger leaves them. On the 6th, Hand complains of stiff and sore legs, and next day, Sunday, Beaumont considers, after examination, it is scurvy, in which he is confirmed the day after by the captain of his sledge, an old whaler. On the 8th "no one cared for their pemmican after an idle day yesterday:" as an old sledge traveller, I should say a bad symptom; in my experience we eat more when detained from bad weather or other cause, *pour passer le temps*. May 11th, 2 A.M., Lieutenant Rawson is sent back with Hand, "who can scarcely get along in the soft snow." The loss of his second in command was severely felt by Beaumont, as well as the weakening of the party by one-half; but events proved its necessity, as Rawson did not reach Polaris Bay till June 3rd. Hand, who had been carried on the sledge since May 19th, died six hours after their arrival. Bryant had been unable to drag since May 23rd from scurvy, and Regan, A.B., was found by Dr. Coppinger to be suffering also from scurvy.

After Rawson left, the travelling appears to have been good for a few days, as they made 10½ statute miles on the 12th, and 8¾ on the 13th. On the 16th, being "Craig's birthday, we celebrated it by giving him an extra allowance of tea." Shades of Benbow, a sailor drinking tea on his birthday! The schoolmaster must certainly be abroad. The snow now became very deep, varying from "2½ to 4 feet deep, and was no longer crisp and dry, but of the consistency of moist sugar. Walking was most exhausting; you literally had to climb out of the holes made by each foot in succession—the hard crust on the top, which would only just not bear you, as well as the depth of snow, preventing you pushing forward through it, each leg sunk about three inches above the knee, and the effort of lifting them so high soon began to tell on the men." May 18th, "Our next march was made under a hot sun, through snow never less than 3 feet thick; we were parched with thirst, and obliged to halt every 50 yards for breath."

As the shore appeared 2 miles off, Beaumont went ahead to look for better travelling, with what success his remarks will best show. "I got about 1½ mile ahead of the sledge in three hours. I was nearly done, so I hailed them to go to lunch, but would

rather have missed three meals than have gone back all that distance, so I had a good rest and made a sketch instead, and then, seeing that the sledge would never reach me that day, I started back for them, walking in my track. In the meantime, the men had been struggling on as best they could, sometimes dragging the sledge on their hands and knees to relieve their aching legs, or hauling her ahead with a long rope and standing pulls." When halted for lunch another day, "two men crawled on hands and knees for 200 yards, rather than walk unnecessarily through this dreadful snow . . . . but although tired, stiff, and sore, there is not a word of complaint—they are cheerful, hopeful, and determined." Only a mile was made that day. As the land appeared only a mile off—as it had done for the two previous days—after an hour's work with sledge, and making no progress, at 8 p.m. they started for it in two ranks, three abreast. At 1 a.m. it appeared no nearer, so, sending all back but Gray, he and Beaumont, after two and a-half hours' more walking, reached the land near Mount Farragutt. They returned in two and a-half hours to the sledge, arriving at 8.45 a.m., "showing the difference between making a road and walking in an old one." Resting and bad weather detained them till 7 p.m. 22nd, when the homeward route commenced—"every one in low spirits at our disappointment," two men unable to drag, and three others suffering from scorbutic symptoms. On the 26th, the two former are unable to "put on their own footgear," and Paul is unable to drag. On June 3rd, they have to carry him on the sledge. The sledge-fare is also distasteful to the poor sick men, and slow as is the progress of the sledge—1½ mile a day—they have to wait for some of the invalids. June 7th, "Jenkins felt unable to go a step further; made room for him on the sledge."

From this time, as there are but three to drag, only two being sound, half-loads have to be taken on, the two men carried being quite helpless. June 11th, "We had some preserved meat for supper that had been left for the dogs, but which the sick enjoyed most thoroughly." On the 11th they started, intending to cross the channel for the 'Alert,' being uncertain as to the road to Polaris Bay, or whether they should find any one there or not; but before they were a mile from the shore they "came to open water, a long patch 30 or 40 feet broad, with ice around very rotten;" there were also patches of open water, which, with a broken-down crew and no boat, precluded any idea of crossing, so, reluctantly returning to the shore, completed provisions from the depôt and started for Polaris Bay 42 miles off. On the 12th, leaving three sick men in the tent, commenced advancing by half-loads. In less than an hour, "Dobbin was obliged to stop . . . . whilst Jones said he had never been so bad before. . . . . If these two men went down, there would only be Gray and myself to take the five on to Polaris Bay, 42 miles off;" therefore, leaving them to find the way back, Beaumont and Gray took the sledge back to the depôt, and completed to eighteen days' provisions. Jones almost broken down; Beaumont and Gray themselves feeling stiff and sore, with premonitory scorbutic symptoms, had now to drag on the provisions and two sick men, the others hobbling along very slowly, marching between 2 and 8 miles a day, but only making good from 1½ to 2 miles; one day I see 8 miles marched and none made good, next day they did 4 miles; this was in soft snow, more than half-thawed, wetting them through to the thighs, or wading through ice-cold water; and only those who have experienced it can know how painful it is to have a constant stream of it pouring down on the foot, over the boot-top, for hours every day, or how hard men, who have once experienced it, will work to get back before the thaw commences—it is more dreaded and worse than extreme cold while on the march. In one ravine the sick had to be lowered down, lashed up in a sail; and so the weary time passed till 2 A.M., June 25th,, when they were providentially met by Lieutenant Rawson, Dr. Coppinger, Hans the Eskimo, and 8 dogs; they were then 21 miles from Polaris Bay. The lime-juice and preserved meat, I need scarcely say, did much towards reviving the sick, also the certainty of now being near the end of the dreary journey. The two worst cases were taken to Polaris Bay by Dr. Coppinger on the 28th, which he reached next morning, but too late to save the life of Charles Paul, A.B., who died at 5 P.M. of the 29th, and was buried beside J. Hand, A.B., who, as already stated, had died June 3rd."

The remainder of the party arrived at Polaris Bay at 7 A.M., July 1st, where seal meat, geese, musk ox, rest, and the arrival of Captain Stephenson, July 19th, with boots and medical comforts, such as vegetables and port wine, restored the scurvy-stricken party, as Dr. Coppinger reported all of them to be on his meeting them. Beaumont, with some of the party, did not rejoin the 'Discovery' till August 15th, having had an unpleasant time crossing Robeson Channel in a boat, with a drifting pack—child's play, however, to what they had gone through. This party was 132 days absent from their ship, ninety-two days travelling, the remainder in Polaris Bay. Eighty-one marches were made, distance travelled was 508 statute miles; the longest march was 10·5 miles. It is difficult to calculate the distance travelled by the sledge. The distance accomplished does not, however, give the faintest idea of the labour expended, as least distance means really hardest work.

Did space permit, double or treble the number of similar extracts from these modest and unassuming journals could be given, in which the Commanders, while making no mention of themselves, give the highest praise to the officers and men under them for their energy, zeal, and perseverance in striving against obstacles no previous sledges ever experienced for so prolonged a period, and for their patience and cheerfulness when prostrated by scurvy, or for the assistance given to the sick and helpless. Lieutenant Beaumont made special mention of Frank Jones (stoker), who "earned the gratitude of the whole party by the cheerful manner in which he carried out the numerous duties which devolved upon him. Even after he himself fell sick, his patient kindness to all was beyond praise," and not the least of the troubles of the sick, "while suffering agonies," was the thought they were a burden to their fellows, and that their work had fallen short of their predecessors. Their deeds speak for themselves far more eloquently than words of mine can do; the only comment I have to make is, that though they did not command success, none have ever better deserved it.

We have pleasure in adding the following letter from an old Arctic seaman to the above review of the sledge journals. The writer was a petty officer who served in three Arctic Expeditions consecutively, and was captain of a sledge during the spring travelling. He, like the officer under whom he served, was misled by appearances, and at first thought that the old hands would have done better; but a perusal of the sledge journals of the officers of 1876 has altered his opinion on that point:—

"I this day return to you the journal and reports you were so kind as to send me. A thousand thanks for having allowed me the glorious privilege of perusing them. I have carefully read them, and pondered over every line with the deepest interest. One cannot read such painful narratives without allowing one's mind to be disarmed of all hostile criticism, and why the Expedition so soon returned is no longer a mystery to me. The formidable obstacles the parties had to contend with, and the almost superhuman exertions made to surmount them, are, I believe, without a parallel in the history of discovery. Really, had it not been for the indomitable courage, energy, and perseverance of the officers, I question whether the whole affair would not have come to a fearful issue. There is to me one noticeable fact in the case. They had not made more than two or three journeys from the ship, when the officers wrote in their journals that the men were complaining of being tired, a proof that all was not sound within. Everything, in my opinion, goes to prove that travelling had nothing to do with originating the scurvy, and all the lime-juice in the world would not have altered the case."

THE PRESIDENT OF THE AMERICAN GEOGRAPHICAL SOCIETY ON THE ENGLISH ARCTIC EXPEDITION.

Chief Justice Daly, the President of the American Geographical Society, has written a very able and, in the highest sense, judicial article on the English Arctic Expedition, in the *North American Review* for March-April 1877. We recently called attention to an excellent article on the same subject in the *Quarterly Review*, and the two may be received as the true voices of England and America.

The admirable work and striking success of the Expedition has been recognised with pride throughout Great Britain and Ireland, and that recognition has been expressed on many opportunities and in many ways. The vast gathering at the meeting of the Royal Geographical Society, at St. James's Hall, on December 12th, was one enthusiastic expression of this feeling out of many. Probably the most emphatic and decisive demonstration, and no doubt that which was most satisfactory to the members of the Expedition themselves, was the dinner given to them by the whole body of old Arctic officers. But every true Englishman who has read the carping criticisms, the attempts to damn with faint praise, and the actual misrepresentations which have disgraced the columns of a portion of the English press, since the return of the Expedition, must have done so with feelings of shame and disgust. Much has been said of the physical scurvy from which our gallant explorers suffered, which, however, only brought out their fine qualities with more prominence. Better that than the moral scurvy, showing itself in pitiful attempts at detraction, which afflicts the writers to whom we have had to refer. Well may Chief Justice Daly, an impartial Judge in every sense, pronounce their attacks to be alike ignorant and unjust.

Those who are conversant with Arctic literature, know well that other Expeditions, including those of Parry himself, were exposed to similar attacks; and, so long as the great heart of the nation is sound, scum of this description is as harmless as it is ephemeral. The worst feature in the present exhibition of spite is that the very sufferings of our brave Arctic heroes have been turned into a pretext for throwing dirt at their commander.

We gladly turn from this discreditable rubbish to the generous and appreciative pages of our American contemporary. Chief Justice Daly recounts the difficulties and dangers of the voyage up Smith Sound, the autumn travelling, the proceedings in winter quarters, and the heroic efforts of the sledge-travellers during the spring; and he enumerates the rich harvest of scientific results obtained by the Expedition. The learned American expresses the opinion that "by the geographer and man of science the voyage will be pronounced a most important and successful one." He then administers a well-deserved rebuke to the yelping pack of fault-finders in this country. "Much of this fault-finding," he observes, "so far as it has fallen under our observation, has been by writers whose productions show that they have but a very limited acquaintance with what is known respecting the Arctic. A leading English journal, the *Saturday Review*, went so far as to declare that the principal officers in command had no heart in the work; that they went because they were appointed, and returned as speedily as they could. To us, on this side of the Atlantic, this appears to be exceedingly unjust. Judging only from what is known to the world, but little if anything more could have been accomplished by remaining another year with crews disabled by scurvy. The wise and true course was to return at the first available opportunity. Sir George Nares's decision in this respect has been approved by the Admiralty, and will be approved by all who are familiar with the history of Arctic exploration."

Chief Justice Daly then gives a *resumé* of the contents of the very able paper read by Sir George Nares at the great meeting of the Royal Geographical Society, on the 12th of December, and enters upon an interesting and almost exhaustive discussion of the arguments respecting the theory of an open Polar Sea. He closes a most valuable paper by an admirable defence of Arctic exploration. "There is no portion of the earth's surface where exploration for scientific purposes is of so much value as in the Arctic regions. There is scarcely a problem relating to the physics of the globe which can be fully understood without a knowledge of the phenomena within the Polar regions. Whatever phenomena we may wish to investigate, it is of special importance to determine its maximum and minimum values, and in nearly all questions of terrestrial physics, one or other of these values is found in the neighbourhood of the Pole. If, for example, we wish to determine the extremes of temperature, one is to be

found near the Equator and the other near the Poles. If we wish to investigate the system of circulation of the winds, our investigation would be sadly deficient without a knowledge of the phenomena of the Polar regions. If we wish to investigate the currents of the ocean, we find indications of currents coming from the Polar regions, and it is important to be able to trace these currents to their source. If we wish to investigate the laws of tides, we need observations from every ocean; and observations in the Arctic regions have a special value, on account of their distance from the place where the daily tidal wave takes its origin. If we wish to study the phenomena of atmospheric electricity, no part of the world is more important than the Polar regions." And so as regards the phenomena of terrestrial magnetism, the dimensions and figure of the earth, and the variations in the force of gravity. "In short, there is no problem connected with the physics of the globe which does not demand observations from the Polar regions, and generally the Poles and the Equator are more important as stations of observation than any other portion of the earth's surface. If the information which has been acquired on these various subjects in the numerous Polar expeditions of the last half-century were annihilated, it would leave an immense chasm."

THE MORAL SCURVY.

I.

The virulent attacks upon Captain Nares, and his conduct of the Arctic Expedition, by a portion of the press, which is afflicted with a sort of moral scurvy, have hitherto been treated by us with silent contempt. We are old enough to remember similar attacks on other distinguished officers and on other successful enterprises, and we know that they have no lasting influence. No one remembers the names of the men who reviled Parry, or Ross, or Austin, or what they said. All we know about them is that the breed is not yet extinct. The malice of the revilers and detractors of to-day will be forgotten to-morrow. The work of Nares's Expedition will be valued, and the heroic endurance of his officers and men will be spoken of with pride and admiration as long as England exists.

We believe, however, that constantly repeated assertions, however false, if uncontradicted, are calculated to be mischievous, although that mischief can only be temporary. We have, therefore, decided upon answering every attack, and exposing every erroneous statement that is published, and which comes to our knowledge, having reference to the work of the Arctic Expedition. In many cases the detailed information contained in our former articles will refute the assertions which we shall have to denounce; and it will be sufficient to supply our readers with a reference to the particular passages. Occasionally, however, a fuller exposure will be needed.

The *Saturday Review* is, we regret to see, a foremost offender. That paper has already received a well-deserved rebuke from the distinguished author of the article in the *North American Review*, for its ignorance and injustice in writing of Arctic matters. It nevertheless returns to the subject, and makes several statements in its number of March 17th, 1877 (p. 315), which we now proceed to refute.

1. *Captain Nares made a hasty and dogmatic assertion that the North Pole was impracticable.* This shameful misrepresentation has been exposed over and over again. Captain Nares never made any such assertion. He said that the North Pole was impracticable by the Smith Sound route; that it was impossible to reach it, without depôts, over the frozen sea to the north of Grant Land, which was simply the statement of a well-ascertained physical fact, and was neither hasty nor dogmatic.

2. *The obstacles encountered were, with the exception of the scurvy, only just what were to be expected.* The readers of the sledging journals know how utterly untrue is this assertion. The obstacles were not and could not be expected, as they were unparalleled in the whole annals of Arctic exploration. The evidence of the distinguished Arctic officer who reviews the sledging journals, in the first article of our present number, is conclusive on this point.

3. *The time was wasted in dawdling and idle excursions.* This statement is unintelligible, and we can only suppose the writer must be scribbling at random. All the sledging parties were sent on defined and useful work, each one serving a purpose in the main objects of exploring, as far as possible, east, west, and north.

4. *Captain Nares chose to disregard his positive instructions, which were to make a sledging attempt to reach the Pole the main feature of the voyage, and not to make detailed surveys.* Captain Nares's instructions were not positive but discretionary; they indeed warned him that it had never been found practicable to make a very extensive sledging journey away from the land across a frozen sea. Captain Nares did make an attempt to reach the highest northern latitude possible the main feature of the voyage, and a most gallant attempt it was. He did not make detailed surveys.

5. *Captain Nares was sent out to stop three seasons, and hurried home at the end of the first.* The instructions to Captain Nares were not to stop out three, or even two winters if it could be avoided; but to come home after the first winter, if a reasonable amount of exploration had, in his judgment, been completed. An abundant amount of exploration was completed; at the same time, Captain Nares did not hurry home, but returned very reluctantly, in obedience to the dictates of an imperative duty, and to avoid serious loss of life.

6. *The scurvy was due to the omission of lime-juice from the rations of the sledge parties.* The fact that lime-juice was never taken as a ration by any sledge party in any previous Arctic Expedition which had no scurvy, is a proof that this was not the cause; but that the scurvy was due to exceptional causes in operation before the sledge parties started.

7. *Captain Nares had not sufficient reason for departing from the instructions in Dr. Armstrong's Memorandum.* Dr. Armstrong's Memorandum consists of hints and suggestions, which were in no sense instructions. Captain Nares very properly followed the precedents and advice of the most experienced Arctic travellers and medical men. Dr. Armstrong recommended that lime-juice should be taken in intense cold, without suggesting any means of using it. Though well knowing that this had never been done before by more experienced Arctic men than himself, whose practices Captain Nares would be sure to follow,

he only gave one line of bald advice, without explaining why former precedents were to be abandoned, and how his crude hint was to be carried into effect.

8. *Captain Nares invented a theory that frozen lime-juice could not be melted, when it appears that it can be melted by the easy plan of putting the bottle in the sleeping bag between the legs at night.* Captain Nares had no need to invent theories about the difficulty of thawing anything during intense cold, as he had had abundant practical experience while sledge-travelling in the previous expedition in which he served. The notion of melting lime-juice in the sleeping bags between the men's legs, at a temperature below zero (that of April while travelling), is too absurd to merit further notice. But it is important to observe that it was quite impracticable to use lime-juice as a ration, during April, in the form and in the receptacles in which it was supplied; that Dr. Armstrong knew, or ought to have known, that fact; that if he thought daily rations of lime-juice while sledging were indispensable, he was bound to have devised and suggested a means of using it; and that, in neglecting to do so, he, and he alone, is to be blamed for the outbreak.

So much for the misrepresentations of the *Saturday Review*. The next scurvy writer is one who, judging from the amount of acid in his compositions, has not found that specific to be a curative in his own case. The publication calling itself *Truth*, has an article containing the following statement, in its issue of March 15th, p. 343:—

Captain Nares, instead of sending lime-juice with his sledge, sent rum. If this is intended to mean anything, it means that Captain Nares excluded lime-juice from the sledge dietary, and substituted rum. The truth is that Captain Nares adopted exactly the same scale of diet as long experience had proved to be best, and as was used by the sledge travellers of former expeditions, except that he reduced the quantity of rum by one-half.

The rest of the article is mere vituperation unworthy of notice, and it concludes with the assertion that the Arctic Expedition was "a disgraceful failure," and that "efforts to hush the scandal up must be stoutly resisted;" in other words, there is to be a continuation of statements of the above character. By all means. They will be exposed as they appear, and will only bring shame on the concocters of them, if they are capable of feeling shame. There has been, and can be, no desire to hush up anything connected with the gallant enterprise which has been so nobly carried out, and which, while extending our geographical knowledge, has added so much to the prestige of the navy. Every incident connected with it, and every detail of its management, will long be carefully studied by all who are interested in Arctic exploration; while the perseverance, endurance, skill, and true British pluck of its sledge travellers will be dwelt upon with pride and admiration by successive generations of Englishmen.

We cannot conclude these remarks without referring, with pleasure and relief, to the healthy portion of the press; and especially to an admirable article which has lately appeared in the *Standard*. The writer shows a thorough knowledge of the subject, and he has not been taken in by the alleged Report of the Scurvy Committee, which was published by the *Sanitary Record*, and which has misled many others.

CHILE.

THE publication of the interesting Report by Mr. Horace Rumbold, H.M.'s Chargé d'Affaires and Consul-General in Chile since 1872, and of the second volume of the *Anuario Hidrografico*, by Captain Vidal Gormaz, have recently obtained for the Republic of Chile an amount of attention among geographers and general readers which the subject well deserves. The progress of this rising State has been marvellous since the days of its war of independence, when so many books were written about it; while its physical features, its history, and the exploration of the little-known regions to the south, must ensure for Chile special interest in the minds of all geographers whose thoughts are not confined to one region, or one quarter of the globe. Yet, until the appearance of Mr. Rumbold's Report, very little of any value had been written, in England, respecting the Chilian Republic within the last few years; and reliable information was not readily accessible. It seems opportune, therefore, to pass briefly in review the principal events in Chilian history and geographical research; and to refer, at the same time, to the various sources of information respecting the most flourishing of the Spanish American Republics.

Mr. Rumbold describes Chile as a strip of coast-land pent in between nearly the loftiest mountains and the broadest ocean of the globe, and containing 220,000 square miles. It extends for 2270 miles in length, from the frontier of Bolivia in 24° S. to Cape Horn in 56° 29′ S.; its width varies from 40 to 200 miles; and the principal part may be described as one broad valley running north and south, with narrower, lateral, and intersecting valleys, each rising step-like above the other to the foot of the giant wall of the Andes. The main physical feature is the mighty cordillera towering above these fertile valleys, with a mean height of 11,830 feet, but with numerous far loftier peaks. Among these there are twenty-three volcanoes. Aconcagua, to which peak Fitzroy and Beechey gave an elevation of 23,910 feet, has been reduced by Pissis to 22,296. Tupungato rises to 20,269 and Villarica to 15,996 feet. Extending over so many parallels of latitude Chile necessarily has a variety of soils and climates. In the north is the sandy desert of Atacama, rich in mineral wealth; central Chile is agricultural, and contains all the principal cities and sea ports; while in the south are the forests and lakes of a colder and more rainy zone. The rivers flow rapidly from the Andes to the Pacific, the largest, the Bio-bio, only having a course of 220 miles.

There is some difficulty respecting the affinities of the aboriginal inhabitants of northern and central Chile, caused partly by the fact that there was considerable mixture with the Peruvians before the Spanish conquest, and that many Quichua words had crept into the Chilian dialects. The very name of Chile is probably the Quichua word *chirí** (cold). The Ynca Garcilasso de la Vega tells us that his ancestor, the great Ynca Yupanqui, of Peru, was the first to undertake the conquest of Chile, and his expedition brought the first tidings of this distant

* Not "*Tchile*, the Peruvian word for snow," as the new edition of the *Encyclopædia Britannica* tells us. *Riti* is the Peruvian word for snow.

southern land. The Ynca's army crossed the desert of Atacama in about 1460 A.D., and reached a populous district called Copayapu, the modern Copiapo. Thence the Ynca General, Sinchi Rucca, advanced to Cuquimpu, and onwards to what Garcilasso calls "the valley of Chile, from which the whole country took its name of Chile." This, I suppose, is the valley of the Mapocho, in which Santiago, the present capital, is situated. The Yncas reached the banks of the River Maule, but here they found their match in the warlike Purumauca Indians, afterwards called by the Spaniards Promaucaes, who resolved to die rather than lose their ancient liberty, and they were joined by the tribes called Pincus (Pancones of the Araucana) and Cauquenes. A desperate battle, lasting four days, obliged the Yncas to retreat, and to fix the River Maule as the southern boundary of their empire. Ercilla says that they lost their camp and all their ensigns.* It would appear that the Yncas had been thus established in northern and central Chile for nearly a century before the Spanish occupation.

The famous march of Diego de Almagro into Chile with 570 Spaniards, and a large Peruvian contingent under the Ynca Paullu, took place in 1536, but the enterprise was abandoned in 1538. Three vessels were prepared to bring provisions by sea, but one under Juan Fernandez was detained at Callao, and the other, under Alonzo de Quintero, ran on shore off Pisco. The third, named 'Santiguillo,' arrived safely on the Chilian coast; and when the news reached Almagro, he sent the commander of his vanguard, a young soldier named Juan de Saavedra, to communicate. Saavedra found the little vessel in a port to which he gave the name of his own native village in Spain, a place called Valparaiso near Cuenca, which he was never destined to see again. He was hanged at Lima by the cruel Carbajal.

Almagro returned to Peru to misfortune and death, and the famous Pedro de Valdivia was destined to be the first permanent settler in Chile. In 1540 he marched southwards, and founded the city of Santiago, on the Mapocho, on the 24th of February, 1541. He opened a rich mine at Quillota, and, after receiving reinforcements under Francisco de Villagran, he defeated the dreaded Promaucaes, advanced far to the south, temporarily subdued the Araucanians, and founded many fortified settlements, including Imperial, Angol, Chillan, Valdivia, Villarica, and Concepcion. On the 3rd of September, 1544, Valdivia confirmed the name of Valparaiso, given by young Saavedra, for the port of Santiago, making a noble Genoese sea-captain, named Juan Bautista Pastene, its first governor. The rising of the Araucanos, the battles which ensued, the treachery of Lautaro, and the final capture and death of Valdivia, form the most romantic episode in the *Araucana* of Ercilla, and the story is also well told by the Ynca Garcilasso.†

These early conquerors tell us little respecting the natives of Central and Northern Chile; but it may be gathered that the inner valleys were inhabited by a people more allied to the Araucanos than to the Yncas, while along the Chilian coast dwelt a peculiar tribe of fishermen called *Chancos*, who are still met with at Cobija, and other ports of the desert. In Atacama there is still a tribe with a peculiar language, vocabularies of which have recently been collected, and which is quite distinct from Quichua or Aymara. It would appear from what Vicuña Mackenna says of the Chancos, in his learned *Historia de Valparaiso*, that the words of their language are to be found in the Araucan dictionary of Padre Febres; and we may, therefore, suppose that this tribe of the sea-coast advanced northwards to the confines of Peru, from the Araucan country.

When the news of Valdivia's death arrived in Europe, King Philip was in England, and among the numerous volunteers for service in Chile was one of his pages, Don Alonzo de Ercilla. This young soldier and poet served against the Araucans from 1554 to 1562, under Don Garcia Hurtado de Mendoza, afterwards Marquis of Cañete and Viceroy of Peru. Never had a people fighting for independence such a poet to record their valour in the ranks of their enemies. This is the glory of Ercilla's epic. He enlists the sympathy of his readers for the very foes who, in almost daily encounters, were seeking his life. His cantos may be too minutely topographical and too detailed, and he may often transgress in other ways by disregarding the rules of poetry; nevertheless, there is the ring of true metal in those stirring cantos of the young soldier-poet, written by the camp fires, night after night, after the battles were lost or won. No one who wishes to know anything of Chile should fail to read the *Araucana* of Alonzo de Ercilla. There is a complaint against him that he scarcely mentions his general, Hurtado de Mendoza, because that famous commander once punished him for having drawn his sword upon a comrade during a tournament. But the omission is abundantly made up for by that general's biographer, Suarez de Figueroa,* whose work should also be read by the student of Chilian history. A Chilian named Pedro de Oña, in his *Arauco domado*, continued Ercilla's narrative down to 1596.

In 1599, Martin Garcia de Loyola, the Governor of Chile, was slain by the Araucans. He was a nephew of Ignatius Loyola, and husband of an Ynca princess. At the same time, the Spanish towns of Valdivia, Imperial, Angol, Chillan, and Concepcion were destroyed, the male inhabitants killed, and the women carried away into captivity. The periodical wars continued without intermission until 1640, when at last the Marques de Baides, Captain General of Chile, through the intervention of the Jesuit Missionaries, made a treaty with the Araucans.

Meanwhile, Central and Northern Chile were becoming settled, towns were rising up, the population was increasing, and a trade was springing up with Peru. Mr. Rumbold is mistaken in supposing that Chile was disliked by Spanish officials. The settlers were chiefly from Biscay and Aragon, and they found a delightful temperate climate and fertile soil in the country of their adoption. The Captains-General sought the appointment, because it was a stepping stone to promotion, and several of the ablest Viceroys of Peru received their training in administration at Santiago de Chile, including the Marques de Cañete, Manso the Conde de Superunda, Amat, Jauregui, and O'Higgins.

The name of O'Higgins is indissolubly connected

* G. de la Vega, Comm. Real. I., lib. vii., cap. 20. *Araucana* I., Canto I., i. p. 14 (ed. Madrid, 1776).

† I. lib. vii., cap. 23.

* *Hazañas del Marques de Cañete*, por Suarez de Figueroa.

with Chilian history, and the story of the elder O'Higgins is so romantic that we cannot refrain from relating it. Ambrose Higgins was an Irish lad, born near the castle of Dangan, and his first employment was to carry letters to the post for Lady Bective. He had an uncle, a priest at Cadiz, to whom he was sent to be educated, and in course of time he found his way to South America, keeping a little shop under the Cathedral at Lima. He went thence to Chile, and, having shown some engineering talent, he eventually obtained a commission in the army. Having distinguished himself in a campaign against the Araucans, young Higgins received the chief command at Concepcion, where he entertained La Perouse, who wrote so strongly in his favour, that the French King applied to the Spanish Government for his promotion. So the young Irish post-boy at last became Captain General of Chile, and he then seems to have placed the O' before his name. Vancouver gives some account of him in one of the latter chapters of his narrative.

O'Higgins was one of the best rulers Chile ever had. He ameliorated the condition of the labourers, by suppressing the "encomiendas," or fiefs, in 1791, made the excellent road from Santiago to Valparaiso; and sent home money to his poor relations in Ireland, through Mr. Kellett, the clergyman of the parish. Finally, Don Ambrosio O'Higgins was created Marquis of Osorno and Baron of Ballenar, and was Viceroy of Peru from 1796 to 1801. The Viceroy had a strong Irish brogue. His son Bernardo was the General in the war of Chilian Independence.

The most complete history of Chile, during Spanish times, is contained in the elaborate history by Don Claudio Gaye; but the works of Molina and of Father Alonso de Ovalle, both of which have English translations, should also be read by inquirers who wish to have an adequate knowledge of the subject.

Chilian independence was at first secured without a blow. The Captain-General Carrasco was replaced by Don Mateo Toro y Sambrano, Conde de la Conquista, and on September 18th, 1810, the new government was proclaimed. The first congress peacefully assembled in June 1811, and enacted many reforms, including steps for the abolition of slavery. Harmony was, however, destroyed by three ambitious brothers named Carrera, who, in December 1811, forcibly dissolved the Congress, and made themselves arbitrary rulers. This gave a pretext for the Peruvian Viceroy Abascal to send an invading force under General Pareja, which landed at Talcahuano early in 1813, and occupied Concepcion. José Miguel Carrera advanced against the Spaniards, who took refuge in Chillan, where Pareja died. Then followed numerous skirmishes, in which young Bernardo O'Higgins, and another Irishman named Mackenna, from County Monaghan, specially distinguished themselves. The Carreras were taken prisoners, and O'Higgins then took command of the patriot troops, while Don Francisco de Lastra became Supreme Director in 1814. In the same year, the Spanish General Gainza arrived with reinforcements from Peru, seized upon Talca, and entirely defeated the patriots at Cancha-rayada. The Carreras were released, and again brought confusion with them, seizing the reins of government at Santiago, and deposing Lastra. A treaty had been signed with the Spaniards at Talca, but the Viceroy of Peru refused to ratify it, and demanded unconditional surrender. More reinforcements were sent from Lima under General Osorio, and a Spanish army marched upon Santiago. The elder Carrera and O'Higgins advanced to the south as far as Rancagua, where the latter barricaded the streets, but Carrera held aloof, and in fact proved himself to be a traitor. On October 1st, 1814, the Spaniards attacked Rancagua, and there was a desperate action, which lasted for thirty-six hours. O'Higgins made a final stand with a handful of men in the central plaza, until, badly wounded and seeing that all was lost, he cut his way through the enemy's ranks, and escaped with a handful of men. The Carreras abandoned Santiago without a struggle and fled to Buenos Ayres,* followed by O'Higgins, with 1400 fugitives, including many ladies, who were hospitably received by General San Martin at Mendoza.

For three years Spanish power was again dominant in Chile. Osorio entered Santiago in triumph, where he arrested many of the principal citizens, confiscated their estates, and sent them prisoners to the island of Juan Fernandez. His troops indulged in unrestrained robbery and licentiousness, and his successor, Marco, even excelled Osorio in tyranny and oppression. But the people were unsubdued. A barrister named Manuel Rodriguez raised bands of patriot guerillas in the north, while others under Freyre and Neira seized Talca, and harassed the Spaniards in Southern Chile.

In 1816 General San Martin, the Argentine General at Mendoza, matured and executed one of the most brilliant military manœuvres of this century. He resolved to cross the Andes with an invading army, and to drive the Spaniards out of Chile. His first aim was to divert the attention and divide the forces of Marco, by making him believe that the attempt was to be made by the pass of El Planchon to the south, opposite to Talca. With this object he went to San Carlos from Mendoza, and held a grand palaver with the Pehuenche Indians, for leave to march through their territory to El Planchon. This news reached the Spanish Captain-General, who sent a large detachment towards Talca. The real intention of General San Martin was to cross the Andes by the pass of Uspallata to Aconcagua, north of Santiago. The army left Mendoza on the 17th of January, 1817, consisting of 3000 infantry, 960 cavalry, the staff and hospital train, besides workmen. All the men were mounted on mules, of which there were 7359 for the saddle and 1922 for baggage. The provisions consisted of jerked beef, seasoned with capsicum, toasted corn, biscuit, cheese, and onions. The field-pieces were slung between two mules when on tolerably smooth ground, but often it was necessary to drag them on kind of sledges made of dried bullock hides, called *sorras;* and even to hoist them up very bad places, or lower them down with derricks. Depôts of provisions were formed at every 12 leagues. The sufferings of the troops were very severe; all suffered from the rarefied air and intense cold, and several died. The pass of Uspallata is 13,125 feet above the sea, and the line of perpetual snow in that latitude is at about 13,000 feet.

* Their history has been written in a voluminous work by Don B. Vicuña Mackenna, entitled *El Ostracismo de los Carreras.*

On the 7th February, 1817, the vanguard of the patriots drove in a Spanish piquet, and San Martin occupied Aconcagua and Santa Rosa. The main body of Spaniards was posted near Chacabuco under General Moroto, on the direct road from Aconcagua to Santiago, and as reinforcements were rapidly countermarching from the south, it was necessary for San Martin to attack at once. The battle of Chacabuco was fought on the 12th of February, 1817. The main body of the patriots advanced up the cuesta of Chacabuco, while a detachment under Soler made an oblique movement to the right. O'Higgins, leading the infantry, commenced the attack, and was repulsed with severe loss, but San Martin followed with a desperate cavalry charge, and Soler following upon the enemy's left flank at the same time, there was confusion, and the victory was completed by a gallant charge of Colonel Necochea. The patriots entered Santiago in triumph on the 14th February, 1817; Marco was taken prisoner, and Bernardo O'Higgins was elected Supreme Director of Chile.

The Viceroy of Peru, Pezuela, then equipped one more expedition under his incapable son-in-law Osorio, which landed at Talcahuano in December, 1817, completing the force there to 6000 men. O'Higgins and Las Heras were at that time investing the place, and they fell back to Talca. In March 1818, Osorio crossed the Maulé, and his vanguard was driven back at a place called Quechereguas. San Martin and O'Higgins had about 8500 men of all arms. On meeting with a check, Osorio countermarched towards the ford over the Maulé, and San Martin advanced in a parallel line to cut off his retreat. The Spaniards reached Talca first, and some sharp skirmishing took place on the plain of Cancha-rayada, followed by a night attack, which threw the patriots into confusion. The army was saved by the presence of mind of Las Heras, and eventually retired to the line of the Maypu, 2 leagues from Santiago, in good order. At this time Captain William (afterwards General) Miller had joined the patriot cause as a captain of artillery.*

The two armies met, and the decisive battle of Maypu was fought on the 5th of April, 1818. The engagement had not lasted an hour when the Spaniards gave way at all points, 2000 were killed, 3500 taken prisoners, and Osorio escaped to Talcahuano. This victory finally established the independence of Chile. The next measure was to organise a fleet, which at first consisted of some old Indiamen that were purchased. In November 1818, Lord Cochrane arrived at Valparaiso to take the command; and in February 1820, the forts and town of Valdivia were taken from the Spaniards by a schooner and brig led by Cochrane, with Miller in command of the land forces. Talcahuano and Concepcion also fell, and in August 1822, Lord Cochrane conveyed the liberating army from Valparaiso to Peru. The Spaniards were driven out of their last stronghold on the island of Chiloe in January 1826.

The war of independence, and the enlightened policy of Mr. Canning, drew much public interest to Chile in the years immediately following, and many books of travel in Chile were published. Among these were two quartos, with several illustrations, by Maria Graham (1824) and Schmidtmeyer (1824), the travels of Caldcleugh (1825), Stephenson, Mathison, Scarlett, Sutcliffe, the work of Myers, the journal of Captain Basil Hall (1825), and the charming memoirs of General Miller; while Lord Dundonald more recently gave us an account of his proceedings when in command of the Chilian fleet.

Although the independence is dated from September 18th, 1810, it has only actually lasted for fifty years, during which time a very backward and misgoverned colony has been converted into a civilised and most prosperous republic. O'Higgins held office until 1823, when the unpopularity of his minister obliged him to resign, and he was succeeded by General Don Ramon Freyre. He retired to the sugar estate of Montalvan, in the valley of Cañete, in Peru, where he died in 1842. Freyre was succeeded by General Blanco in 1827, and died in 1851. In 1828 Don F. A. Pinto became President, and in 1829 Don Francisco Ramon Vicuña, who married a daughter of the gallant Irishman, Mackenna, and whose son is the well-known Chilian statesman, Don Benjamin Vicuña Mackenna. In 1830 Don José F. Ovalle succeeded, who died in office the same year, and Don Joaquim Prieto was President of Chile during two terms, from 1831 to 1841. The present Chilian constitution was promulgated in 1833. General Don Manuel Bulnes, who had led the Chilian contingent in the war with Peru, and overthrown the Dictator, Santa Cruz, at the battle of Yungay in 1838, succeeded President Prieto, and held office from 1841 to 1851, when he was replaced by Don Manuel Montt.

The accession of Montt was a bitter disappointment to the liberal party, and General Cruz, the defeated candidate, took up arms. General Bulnes, the outgoing President, took command of the Government forces, and entirely defeated Cruz at Loncomilla, after a hard-fought and very sanguinary engagement. Mr. Rumbold observes, that "the lesson Bulnes then taught his countrymen was that the military element in any well-ordered community, with free institutions, must accept subordination to the lawful civil authority. He gave the death-blow to militarism in Chile, and when, in 1859, at the close of Montt's second term of office, fresh disturbances arose, they were easily quelled by a staunch and undivided army." Montt was succeeded in 1861, by Don José Joaquim Perez; who was followed in 1871 by Don Federico Errazuriz, and on September 17th, 1876, Señor Pinto became President of Chile.

Having thus given a slight general sketch of the political history of Chile, we may now follow Mr. Rumbold in his description of the country, and his report on its moral and material progress.

In the northern provinces of Atacama and Coquimbo are the silver mines of Puquios, Tres Puntos, Chañarcillo, Chimbero, and many others. The desert was explored for the Chilian Government, about twenty years ago, by Dr. Philippi, who reported the existence of silver and copper in abundance, gold, iron, lead, nickel, cobalt, borax, nitrate of soda, and rock salt. In the thirty years from 1843 to 1873, the mines of Atacama yielded annually, on an average, 1,320,000*l.* In the southern part of this region is the Department of Freyrina, containing the highly cultivated vale of Huasco, and famous as one of the greatest copper districts in the world, the adjoining

* See his life, with a list of all Europeans who served in the war of Independence, in the appendix to *Travels in Peru and India*, by Clements R. Markham, (Murray, 1862).

province of Coquimbo being almost as rich. Here are the large copper smelting works of Urmeneta and Errazuriz, and the rich mines of Carrizal, Panulcillo, and Tamaya.

Central Chile comprises the provinces of Aconcagua, accounted the garden of Chile, Santiago, Valparaiso, Colchagua, Talca, Maule, and Ñuble. Here are the largest estates and the most important towns, and Central Chile is distinctly agricultural, as distinguished from the mining north, and the wilder and more pastoral south.

South Chile commences at the River Itata, and includes the provinces of Concepcion, Arauco, Valdivia, Llanquihue, and Chiloe. It is only in part subdued, and in many districts the Araucans are still independent. Here are large coal fields, the climate is moist, and the soil excellent, the harbours are numerous and commodious, the forests which clothe the river banks, and cover the Island of Chiloe,* yield excellent timber, and the country is well adapted for stock breeding. The German colonies at Valdivia and Port Montt are prosperous, although the government has failed to attract a steady stream of immigration.

On April 19th, 1875, the population of Chile was reported to be 2,068,424 souls, an increase of 13·7 per cent. since 1865. At Santiago the population is 180,000, and at Valparaiso 100,926. The independent Indian population is roughly estimated at 44,000, including Patagonians, but it is believed that the number is nearer 70,000.

Great progress is reported in the department of education. In 1874 there were 806 public elementary schools in Chile, with 62,244 scholars of both sexes, besides 478 private schools with 23,198 scholars; the proportion being one scholar out of 4·94 children of educational age. There are also four normal schools for teachers. Higher education is provided for by seventeen colleges or lyceums in the provinces, and the University of Santiago, which confers degrees in law, medicine, and surgery, and diplomas in civil and mining engineering. The expenditure on education for 1876 was 233,414*l.*

The budget of 1876 for ordinary expenditure was 3,366,080*l.*; of which the military and naval expenditure together was 636,096*l.* The strength of the army is fixed at 3573 officers and men, the bulk of the force being quartered on the Araucanian frontier; it is small but thoroughly efficient. The national guard consists of 21,951 men. The navy consists of an iron-clad of 2032 tons, the 'Almirante Cochrane,' and the 'O'Higgins' (7 guns), 'Chacabuco' (7), 'Esmeralda' (12), 'Magellanes' (4), 'Abtao' (5), 'Covadonga,' a gun-boat captured from the Spaniards in 1864, 'Ancud,' 'Tolten,' 'Independencia,' and 'Valdivia,' a total tonnage of 10,095. The 'Valparaiso,' an iron-clad and sister ship to the 'Almirante Cochrane,' was launched in England in May 1875. The navy estimates amount to 244,597*l.* The merchant navy of Chile consists of eighty-seven vessels, of which twenty-two are steamers; but there would be a large increase if the oppressive Navigation Laws of 1836 were abrogated.

In our number for May 1873, p. 73, we noticed the admirable surveying-work that had been done by the Chilian naval officers, especially in the Bay of Reloncavi, separating the coast of Chile from the island of Chiloe; and our number for June 1876, p. 160, contained a review of the first volume of the *Anuario Hidrografico de la Marina de Chile.* The second volume, comprising the work for 1875, is now before us, and it shows that the navy of Chile continues its meritorious exertions in the best and most important work on which a navy can be employed. The present volume contains an admirable memoir on the nautical geography of the Bolivian coast, by Captain Vidal Gormaz, the hydrographer; reports on the surveys of parts of the coast near Valparaiso, by Captain Pomar, in the 'Ancud,' and of a portion of Magellan's Strait, by Captain Simpson, in the 'Chacabuco'; a narrative of an interesting voyage made by Captain Lopez in the 'O'Higgins', including a visit to Easter Island; sailing directions for the River Plate; and the usual well-digested information respecting lights, positions of dangers and wrecks, the whole illustrated by numerous charts.* A full account of the government topographical map of Chile, by Pissis, will be found in our number for April 1874, p. 31.

The ordinary revenue of Chile, in 1874, amounted to 3,080,164*l.*; and the extraordinary revenue, including interest from the loan of 1873, brought it up to 3,133,344*l.* In 1875 the revenue yielded 3,220,000*l.*, and in 1876 it is estimated at 3,330,741*l.* As in other countries, including British India, great expenditure had been sanctioned on public works which were expected to be remunerative, and this outlay has sensibly disturbed the equilibrium of Chilian finance. The sources of revenue are various, two of the taxes being legacies of Spanish rule. These are the tobacco monopoly, and the *alcabálas* or taxes on the transfer of property. There are also taxes on revenues derived from land, on trading and other licenses, but by far the largest item is derived from customs duties.

The total amount of the Chilian foreign debt is 8,137,800*l.*, and the internal debt is 2,185,920*l.*; the whole debt being about three years of the revenue. The charge for interest and amortization of the foreign debt is 676,000*l.*, and for internal debt 263,403*l.* The first money was borrowed in 1822, wherewith to achieve independence. This loan was raised in London at 6 per cent., and amounted to 934,000*l.* In 1842 the interest in arrear was capitalized at 757,500*l.*, with interest at 3 per cent; and since that time the most scrupulous good faith has been kept with the public creditors.

In 1858 Chile raised a loan of 1,554,800*l.* in the London money market, which was taken at 92. The war with Spain obliged Chile to borrow again, in 1866, 1,120,920*l.* at 7 per cent. In 1867, another loan of 2,000,000*l.* at 6 per cent. was raised, being specially secured by the general customs revenue; and in 1870 another loan of 1,012,700*l.* was raised, for the railroad from Chillan to Talcahuano, at 5 per cent. Lastly, in 1873, a loan was effected of 2,276,500*l.* at 5 per cent., for the railroad from Curico to Angol. "The credit of Chile," says Mr. Rumbold, "stands deservedly higher than that of some larger and more powerful States;" but the tendency to

* See an account of Chiloe, by Captain Blanckley, of H.M.S. 'Pylades,' written in 1834.—*Royal Geographical Society's Journal*, iv., p. 344.

* *Anuario Hidrografico de la Marina de Chile.* Año II. (Santiago de Chile, 1876.)

MAP
OF THE
MADEIRA AND PURUS
from an official Brazilian M.S. Map
communicated by
G. E. CHURCH, ESQ.

Scale 1 : 3.000.000.

0 50 100 Statute Miles.
0 50 100 150 Kilom.

72° 71° 70° 68° 66° West from Greenwich. 64°

4° 6° 8° 10° 12° 14°

Cujigenerys Catinas Cocamas Espinos Catuquinas Hypurinas Huaynamarys Machiris Huatchipairys Andes Uzcarayuas Guarayos Pammarys Cipos Hyamamadys Mamorys Rupurucuras Pacayuaras Quarunas Pamas Chunchichis Juruenas Chocobos Juma Purus Juberys & Pammarys

Lago Rogagua do

Rio Madeira Rio Mamoré Rio Beni Rio Guaporé Rio Itenez Rio Paraguay

Barra do Trahuacá · Barra do Mú · Reyes · Exaltação · Santa Cruz · Cuzco · Urubamba · Angostura · Urcos · Puquijana · Sena · Tucuani · Fallile · Aguas Caliente · Santa Rosa · Sandia · Totora · Paucartambo · Cuba · S. Miguel · Porto da Barra · S. José · Santa Anna · S. Pedro velho · Santa Magdalena · Missão de S. Joaquim · Missão da Conceiçao · S. Pedro · S. Ignacio · Boa Vista · Crato · Fort da Conceição · Fort do Príncipe da Beira · Fort de Coimbra · Fort de Principe da Beira

66° West from Greenwich. 64° 62° 60°

US

Map

Manáos

L. Cupeiá

L. Caballos

L. Caldeirão

L. Maracapi

L. Paratary

L. Coarijaz

L. Tracoja

L. Catuzi

L. Tucuman

L. Tracary

L. Freg. de Cary

L. Pirahna

L. Parisatuba

L. Aiapua

L. Aruma

L. Iury

L. Guajaratuba

L. Boa Vista

L. Ipyranga

L. Ubim

L. Raymundo

L. Parana Pianna

L. Tapará

L. Cabixiana

L. Miamary

L. Capiha

L. Jamandina

L. Itapa

L. Maphura

L. Amutatura

L. Umary

L. Siartham

L. Jacundum

L. Paseripua

L. Meripuahan

L. Jamsartham

L. Jacaré

L. Araz

L. Araury

L. Araraquara

L. Chiata

L. Matupiri

L. Jatuarana

L. Atinings

L. Muras-tutuba

L. Tatuhy-Assu

L. dos Ongas

L. Marmellos

L. Bastos

L. Japura

L. de Jacaré or Curupanatuba

L. dos Reges

L. Pirajauára

L. Pindahas

L. Magoary

L. das Arrayas

L. das Flexas

L. de Salomão

L. Ussanti

L. Aponiáo

L. Jamaristiva

L. Tucunaré

L. Marium

L. Serpa

L. Rogagua

L. Reyes

L. Guapi

L. Exaltação

L. Ysirere

Rio Amazonas

Rio Solimões

Rio Negro

Rio Madeira

Rio Purus

Rio Juruá

Rio Jutahy

Rio Tapauá

Rio Coary

Rio Urucú

Rio Catua

Rio Paraná Jutahy

Rio Paraná Mirim de Jutahy

Rio Paraná Mirim das Araras

Rio Paraná Mirim de Guanchi

Rio Paraná Mirim de Pasto grande

Rio Maracassumba

Rio Maracassumbinha

Rio Atininga

Rio Jatuarana

Rio Mamoré

Rio Guaporé

Rio Itenez

Rio Jamary

Rio Machado

Rio Gipparaná

Rio Mequens

Rio Branco

Rio Barco

Rio Beni

Rio Madre de Dios

Rio Manoa

Rio Tapajoz

Rio Cupatana

Rio Arinos

Rio Sumuru

Rio Tapirapecú

Rio Juruena

Rio Sucunduri

Rio Aripuanan

Rio Maués

Rio Abuna

Rio Acre

Rio Yaco

Rio Orton

Rio Manuripe

Rio Madidi

Rio Tuichi

Rio Mapiri

Rio Coroico

Rio Caquetá

Rio Putumayo

Rio Napo

Rio Tiquié

Rio Uaupés

Rio Içana

Rio Xié

Rio Cababuri

Rio Marié

Rio Curicuriary

Rio Cauaburi

Rio Demiry

Rio Jauaperi

Rio Uatumá

Rio Trombetas

Rio Nhamundá

Rio Paru

Rio Jary

Rio Ituxy

Rio Javary

Rio Içá

Rio Yapurá

Rio Tonantins

Rio Jutahy

Rio Jamundá

Rio Tapará

Rio Tapajos

Rio Arapiuns

Rio Curuá

Rio Curuá-Una

Rio Tocantins

Rio Araguaya

Rio Xingú

Rio Iriri

Rio Curuá

Rio Fresco

Rio Iriry

Rio Manicoré

Rio Aripuanan

Rio Roosevelt

Rio Machado

Rio Jiparaná

Rio Mequens

Rio Guaporé

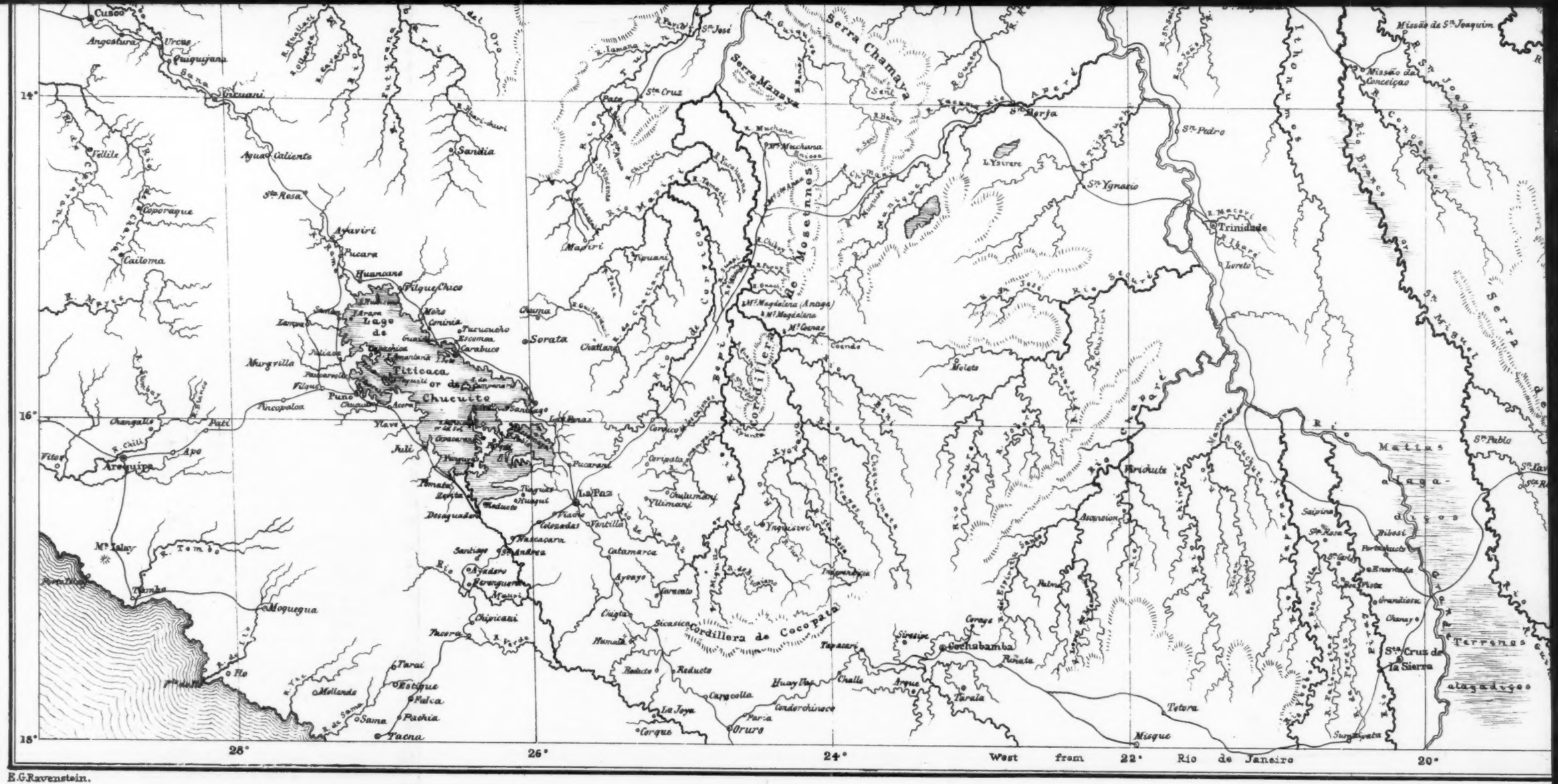
Rio Itenez

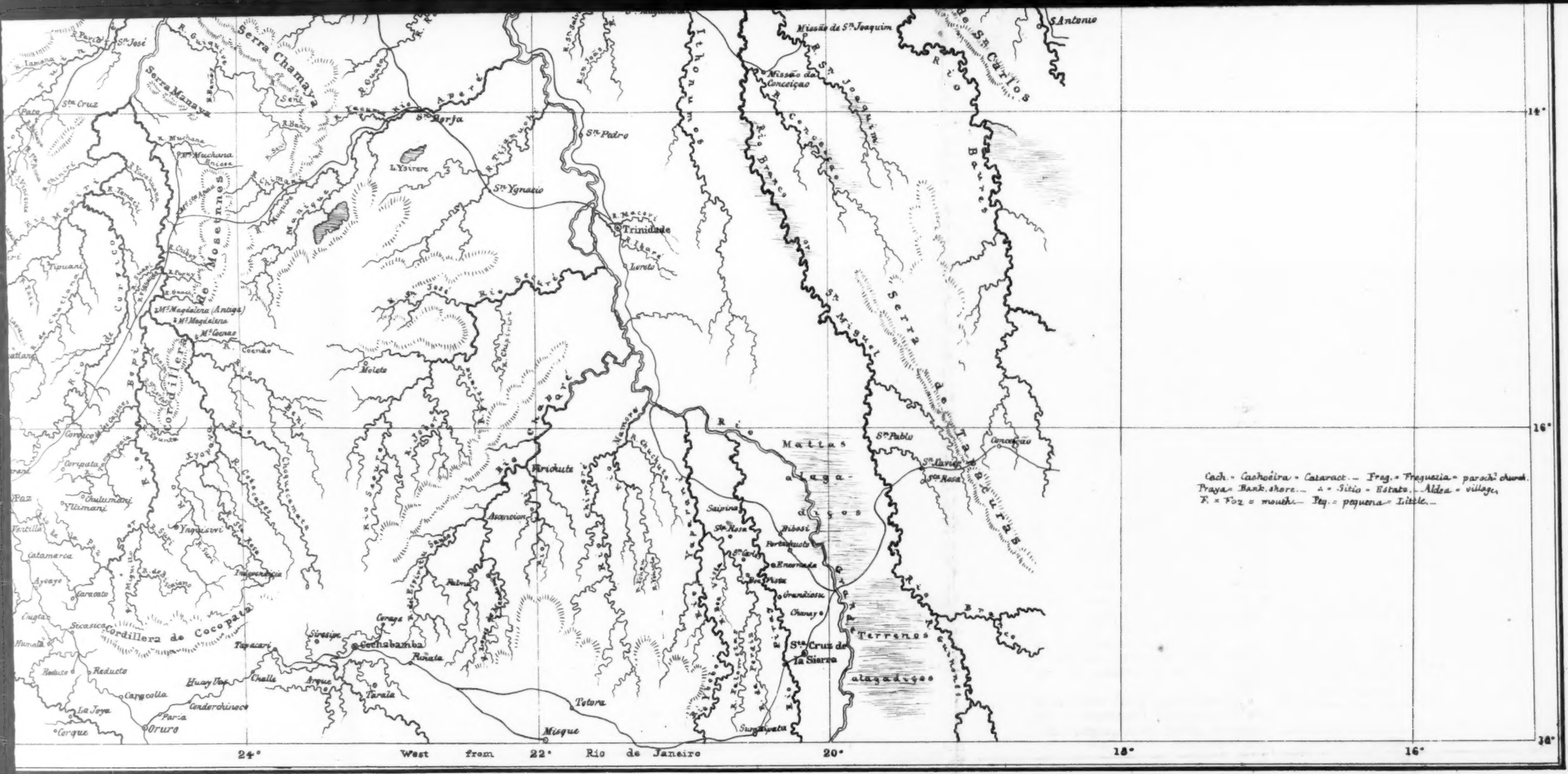
Rio Mamoré

Rio Beni

Rio Madre de Dios

Rio Manoa


Cusco
Angostura
Urcos
Quiquijana
Sana
Livcuani
Sandia
Aguas Calientes
Ste Rosa
Ayaviri
Pucara
Huancane
Pilque Chico
Lago de Titicaca
Murgvilla
Pucarani
Puno
Chucuito
Sorata
Chuana
Challana
Yanacachi
Mapiri
Tipuani
Serra Chamaya
Serra Manaya
Ste Cruz
Pata
Ste Barja
Ste Pedro
L. Ysiare
Ste Ygnacio
Trinidade
Lureto
Mts Muchana
Mts Magdalena (Antaga)
Mts Magdalena
Mts Cocas
Cordillera de Moseynes
Cordillera Real de Cocapata
Molets
Missão de Ste Joaquim
Missão da Conceiçao
Serra Ste Miguel
Rio Matos
Laga-dinos
Ste Pablo
Ste Cruz de la Sierra
Terrenos alagadiços
Cochabamba
Oruro
Challe
Tarata
Tetora
Misque
Sucre
Potosi
Tarija
Tarai
Estique
Palca
Pachia
Tacna
Sama
Moquegua
Tambo
Mts Islay
Arequipa
Vitor
Pati
Changallo
Ilo
Mollendo
Cailoma
Caporaque
Vilque
Juli
Desaguadero
La Paz
Ste Andrea
Catamarca
Ayoayo
Sicasica
Huanata
Reducto
Cargcolla
La Joya
Corque
Chipicani
Pacoro
Ste Rosa
Ste Barbara
Ste Ana
Ste Carlos
Ste Isabel
Ste Rita
Ste Cruz
Ste Ana
Ste Rosa
Ste Barbara


Serra Chamaya
Serra Manaya
Cordillera de los Moseñones
Cordillera de Cocopata
Cordillera de Tarapaya
Cordillera de Apolobamba
Cordillera de Huanacuni
Cordillera de Huayna Potosi
Cordillera de Tres Cruces
Cordillera de Sta Barbara
Cordillera de Sta Rosa
Cordillera de Sta Ana
Cordillera de Sta Cruz
Cordillera de Sta Ana
Cordillera de Sta Rosa
Cordillera de Sta Barbara

borrow for the construction of remunerative public works is one that should be very jealously watched.

The system of railway communication is progressing rapidly. There are the lines from Valparaiso to Santiago, with a branch to Santa Rosa; that to the south from Santiago to Curico; that from Chillan to Concepcion, and there are to be lines from Curico to Angol, and thence still further south. There are also projects for constructing lines across the Andes to the Atlantic. Mr. Wheelwright's scheme was for a line from Caldera, over the San Francisco Pass (16,023 feet) to Cordova*; and other surveys were made for a line much further south, across the pass of El Planchon† (8225 feet). Messrs. Clark, who made the Transandine Telegraph, have a third scheme for a line from Mendoza to Santa Rosa, over the Uspallata Pass, which has been carefully surveyed. The engineer for this line was accompanied by Mr. Granville Milner, H.M. Vice-Consul at Santiago, and we hope, in a future number, to give a narrative of the journey over the Uspallata Pass from the pen of this able and zealous young diplomatist. We noticed the mineral railways in the Copiapo province, constructed from 1849 to 1854 by Mr. Wheelwright, in our notice of Señor Alberdi's life of that great contractor.

But it is to the Pacific Steam Navigation Company that Chile mainly owes its first and most important advances in material prosperity. Some account of it will be found in our account of the life of Mr. Wheelwright, at page 130 of our number for May 1876. The Company's steamers, which go direct to England, by the Straits of Magellan, twice a month, take an average cargo of 2500 tons, composed of chinchona bark, wool, sugar, cocoa, and copper; so that 65,000 tons of valuable merchandise are thus annually conveyed to Europe. The Company's steamers also carry the bulk of the local trade on the Peruvian and Chilian coasts.

Mr. Rumbold gives very complete details respecting Chilian trade. He concludes his most valuable report with some well-deserved, and certainly not too highly-coloured praise of the Chilian Republic, "a sober-minded, practical, laborious, well-ordered, and respectable community. . . . . The blessings which Chile enjoys she owes to the pure traditions implanted in her administration by the founders of the Republic; to the preponderating share taken in public affairs by the higher and wealthier class; to the happy eradication of militarism, and to the patient endurance and capacity for toil of her hardy population." She also owes not a little to English energy and assistance, to the Cochranes, and Millers, and Wheelwrights, who served her with such energy and zeal. No one who has visited the brave little Republic which nestles under the shadow of the mighty Andes, and has known and appreciated the generous and noble character of her people, can fail to cherish happy memories of their visit. Chile has many warm well-wishers in England.

* *Royal Geographical Society's Journal*, xxi., p. 155 (1861).

† *Royal Geographical Society's Journal*, xliii., p. 46 (1873). See also the interesting account of an expedition across the southern Andes, led by Don Guillermô Cox in 1862, from Port Montt and over the pass of Boquete de Royalez (2794 feet) to Lake Nahual-huapi, and back by the Ranco or Lifen Pass (2760 feet) to Valdivia. This seems to be a still easier route.—*Royal Geographical Society's Journal*, xxiv., p. 205 (1864).

THE RIVER PURÛS,

In its Commercial and Geographical Relations to the Valley of the Madeira.

Much has been said of this river as an available avenue for Bolivian commerce. It has been frequented of late years by the rubber collectors, but no exploration, even approximately reliable, has been made of its course except by Chandless in 1864-5. The Brazilian Government had caused four rude examinations to be made previous to the voyage of Chandless, but the meagre data they collected was of little value, except to prove the Purûs to be an important navigable tributary of the Amazon.

Chandless ascended the Purûs 1866 miles. At 1792 miles above its mouth, it separates into two small branches. It may be said that the river is navigable in light draught steamers as far as the Curumahá, a little stream 1648 miles from the Amazon. Its branches will probably add 800 miles more of navigable waters to the parent river. The Aquiry, which enters the Purûs 1104 miles from the Amazon, is reported to be a river as wide but not so deep as the Purûs.

The distinguished traveller, Richard Spruce, states that when, in 1852, the upper Amazon province was separated from that of Pará, the Assembly of the new province dispatched Serafim da Silva Salgado, instructing him "to seek a passage to the towns of Bolivia, by the River Purûs and the savannahs of the Beni, shorter than that by the Madeira, and free from the cataracts of that river."

Salgado was completely unsuccessful in the object of his voyage.

Chandless states that the Brazilian Government dispatched Manoel Urbano in 1860 on an expedition similar to that of Salgado, with the hope of finding water communication between the Purûs and the Madeira above the rapids of the latter river. Urbano ascended the Aquiry a distance of about 400 miles until stopped for lack of water, and failed to discover the communication sought for.

The Purûs is probably as crooked as any river in the world. Its length in a straight line is less than half its length measured by the curves of the river. Its bends are frequently very sharp, rendering navigation exceedingly difficult, except by very short vessels.

Chandless* says:—"It remains only to make some general observations on the geography of the Upper Purûs. From the small size of both branches at the farthest point I reached, and their rapid diminution, it is pretty clear that they cannot come from any *very great* distance; in my opinion little, if at all, to S. of 11° S. latitude—certainly not from the Cordillera." . . . . "If, therefore, the river I followed be, as it has hitherto been considered, the true Purûs, then the Madre de Dios is certainly not the source of the Purûs."

I possess a map, kindly made especially for me by the Topographical Department of the Brazilian Government, giving much geographical data, from the rich collections of the Government, relative to the River Madeira, its affluents, and the region of the River Purûs. According to Chandless and my Brazilian map, the sources of the Aquiry branch do not reach further than 11° 20′ S. latitude.

* See Chandless's "Notes on the Purûs," *Journal of the Royal Geographical Society*, 1866.

The head waters of the Madre de Dios to the east of Cuzco, to which many travellers have penetrated, supposing them to be the sources of the Purûs, lie between 12° 30′ and 14 °30′ S. latitude, and water the great Carabaya slope of the Andes—probably as rich in auriferous deposits as any equal area upon the surface of the globe.* Instead of being the sources of the Purûs, they are evidently those of the great branch of the Beni, named by Padre Revello, "the Madre de Dios," and by the Quichua Indians the Amaru-Mayu, or Serpent river, and by the Tacana Indians, who extensively populate almost its entire course, the Mayu-tata. It is stated by those who have visited it to be equal in volume to the Beni, and to be, perhaps, the main stream. This is not improbable, for Keller gives the Beni, by actual measurement, a volume at its mouth as great as that of the Mamoré and the Guaporé united.† The Mayu-tata enters the Beni probably among the rapids near its mouth. Both the Beni and the Mayu-tata deserve attention, as offering perhaps the most important problems for geographical solution presented upon the western continent. Professor Orton, of Vassar College, has lately proceeded to Bolivia with a view of exploring these rivers, and it is to be hoped that this indefatigable *savant* will soon lay before the world the results of his voyage through a region where nature is riotous in the prodigality of her gifts.

It is notable that the Jesuit Father Eder, in his *Descriptio Provincial Moxitarum in Regno Peruano*, gives upon his accompanying map the Amaru-mayu river as a part of the Lower Beni.

It is possible that the Jesuits in the last century were aware of the course of this river, for, in descending the Mamoré, I learned that the tradition existed that the Jesuits were in the habit of descending the Beni river to its mouth from the Mission of Reyes, and that they occasionally made excursions into the territory to the west and north-west of the mouth of the Beni.

In 1866, two Franciscan friars, from the convent at La Paz, penetrated to the Mayu-tata from the Mission of Cavinas. In December of 1869, at the convent, I met one of these friars, Padre Fidel Codinach, a Spaniard, who gave me some notes from the journal of his voyage: "In the Tacana language, Mayu is always applied to a large river, and Mayu-tata is the 'Great Father river.' The Mayu-lipi flows into the Mayu-tata from the south. Lipi means 'small.' Between the Madidi and the Mayu-tata, and including a considerable district to the north of the latter river, all the Indian tribes speak the Tacana language. It is almost totally different from either Quichua or Aymara, having but a few words in common with them. The Tacana tribes cannot count beyond six. South of the mouth of the Madidi, and between the Unduma and Tegeque branches of the Beni, is found the Mission of Ysiama. Near this mission passes an Ynca road,* which comes from the direction of Cuzco, and runs towards the bank of the Beni. The road is about 25 ft. wide, and long stretches of it, well paved, are still visible.

"The Mayu-tata is five days' journey north-west of Cabinas, the Franciscan Mission on the Madidi—a journey may be counted at 10 leagues. It is as large as the Beni, but has a more rapid current. The Indians say that to the north is another river as large as the Mayu-tata, and but a short distance from it.† They all say that the Mayu-tata flows into the Beni."

In direct translation from Padre Fidel's manuscript:

"*The Araonas* are a very extensive tribe, living along the northern shore of the Mayu-tata, but it is impossible to obtain exact data relative to them. An important fraction inhabit lands between the Beni and the great Madre de Dios. From information extended by them there are from sixty to seventy divisions, counting from ten to twenty families each. The principal part of the tribe inhabits the other side of the Mayu-tata, and, by their own calculation, number more than two hundred divisions."

The Toromonas.—"To the S.S.W. of the Araonas, and about five days' journey from Cabinas, are found the sociable Toromonas. According to the accounts

* Tradition has it that the gold-washers of this district once "sent 'a lump of gold' to the King of Spain the size and shape of a bullock's tongue, which was lost at sea; but in a little while they sent another piece of the size of a bull's head, which arrived safely."—Markham on "The Province of Caravaya," *Journal of the Royal Geographical Society*, vol. xxxi.

† Keller in speaking of the Caldeirão do Inferno, an important rapid of the River Madeira, says:—"Among the persons who have lost their lives at this rapid, we will only cite the Peruvian Colonel of Engineers, Maldonado, who, persecuted in his country for political motives some five or six years since, embarked upon the Madre de Dios, descended by this to the Beni, and by the Beni to the Madeira, dying at the rapid of Caldeirão do Inferno. He thus furnished material proof that the Madre de Dios is an affluent of the Beni and not of the Purûs. It is to be regretted that all the papers of Maldonado were lost on this occasion, two of the rowers alone barely saved themselves. They were ignorant men, who were unable to give extended information upon the region traversed."—*Vide Exploration of the River Madeira*, by Keller. Translated from the Brazilian Government Relatorio of 1869, by George Earl Church.

In the *Journal of the Royal Geographical Society*, page 94, vol. v., part i., 1835, I find a paper by Sir Woodbine Parish, on the explorations of Thadeus Haenke, member of the Academy of Sciences of Prague and Vienna. After accompanying Malaspina on his great voyage, he was sent on a scientific expedition to Peru by the King of Spain. Haenke says: "In October, 1794, the Chuntachitos, the Machuvis, and Pacaguaras Indians who live to the west of Apolobamba, gave me accounts of a very wide and deep river running through a flat and thickly-wooded country, about ten days' journey west of the Beni, where I fell in with them. They distinctly explained to me that a vast many Indians and their families were settled along its shores, that in their language it was called *Manoa*, and that it was a larger river than the Beni."

The *Panama Star and Herald*, of August 5th, 1873, quotes from *El Obrero de Cuzco* the following description of the voyage of young Maldonado:—"Accompanied this time with twelve others, he set out in the midst of the rainy season of 1860. On arriving at the confluence of the Piña-Piña and the Madre de Dios, they constructed a *balsa*, or raft, capable of carrying eight of them, and let themselves go by the stream. The current soon carried them within the limits of the savage tribes, against whose arrows they had to defend themselves for six days, until they came within the reach of savages more docile, from whom they bought a launch. In March they were at the confluence of the Mamoré, which leads up into Bolivia. There six took the launch with their baggage, and the two others followed in a canoe. The Indians endeavoured to make them understand that they must always avoid the left margin of the river. On the 18th of March they forgot the advice of the friendly Indians and crossed over to the left side. The launch upset and Maldonado, with three others, were drowned. The remainder found their way into the territories of Brazil, the authorities of which assisted them to get back to their native place, Tarapoto, where they arrived on the 1st of June."

* Can this be a road built by the Yncas to preserve their conquest of Mojos by the Ynca Yupanqui? It is very important to the history of the empire of the Yncas that more should be learned of this road, its course and extent.

† This must be either the Aquiry or the Purûs.

given of them by the Araonas, with whom they associate much, they are gathered into important towns rather than into insignificant divisions. The towns are five in number, and each one numbers from two to three hundred families, apart from the suburbs of the great centres where numerous smaller settlements are found. The great mass of the tribe is found on that side of the Mayu-tata and among the head-waters of the Mayu-pari, a river of smaller size."

The Pacaguaras.—"Below and to the north of the Araonas is the Pacaguara tribe. Their divisions or clans are small and less in number than the others. They extend from the Beni to the Mayu-tata, and occupy both sides of each river, which is not strange; for, besides their wandering life, they occupy much less space from one river to the other than that occupied by the Toromonas and Araonas."

The Caviñas.—"In the midst of these three great tribes are found the Caviñas, no less inferior in numbers. A great number of them live mixed with the Araonas. This results from a long and bloody war, which, according to traditions, was for many years waged between them, until they made a treaty that the destructive contest should cease, and that the warriors of the Araonas should take wives from the Caviñas and *vice versâ*.

"Notwithstanding there are various divisions which, aside from the three already mentioned, live entirely separate."

Habits and Customs.—It may be said in reality that these are barbarous, but not so much so as is generally supposed. From observation, polygamy is permitted among them up to the number of two wives, but tribal divisions are numerous where the man has but one. In this particular I dare not say that they might serve as models for many of our Christian settlements; for during the whole time I lived among them, giving them attentive observation, I never saw a dishonest action nor heard unkind words. The men hold their wives in the greatest esteem, as well as their children. I have never seen among them any harsh treatment; on the contrary, even in household duties they render each other mutual assistance.*

"There is a complete subordination to their commander and to their priest. I judge that they have their own spiritual head in accord with their religion. I do not doubt but their kindness and certain class of cultivation in their treatment of women is the effect of the non-use of intoxicating drinks; for it has been observed that the Araonas, Toromonas, and Caviñas are frugal, abstemious, delicate, and even moral. With reference to the Pacaguaras, the contrary rules. They are dissolute and much given to that low passion drunkenness, so much so, that not even the women use, as in other tribes, the narrow belt.

"That which is intensely developed among them is idolatry, with great superstition; for every one of the tribal divisions, however insignificant, has its temple or place well adorned, where are found innumerable idols and gods, which consist of numerous little baskets, neatly made and filled with pebbles and little stones of various colours, and also of many sticks of well-polished ebony, carved with heiroglyphics. They worship everything, from the sun to their ancestors, distinguishing the latter by their ferocity or some similar virtue. They decorate these gods with wreaths delicately worked with feathers of various colours.

"Their towns are small, with exception of those mentioned. Each one has its captain and priest, and sometimes both these officers are united in the same person. All the divisions of each tribe are subject to two superior chiefs, one for the time of war, the other for time of peace. To these they render the same honours which they give to their gods. Those now in command are of very religious sentiments.

"With reference to their habits, the tribes vary little one from the other, notwithstanding each has its pecularities. The Toromonas are more hospitable, civil, and laborious. The Araonas are anthropophagi, although the young men preserve more moderation. The Caviñas are distinguished for their treachery, envy, and sagacity. The Pacaguaras are wanderers, having no fixed habitation. They are very suspicious, resolute, and revengeful.

"With reference to the lands occupied by these tribes, they are unsurpassed in beauty, as much for their topography as for their fertility and richness. They occupy a broad space about four degrees of latitude and about eight of longitude. The position is exceedingly agreeable—now extensive groves, which are suddenly replaced by delightful pasture lands—now by brooks, rivers, and ponds filled by numerous classes of fish. The most perfect salubrity of climate exists, despite the warm temperature. The groves are delightful and filled with all that gives pleasure. The leafy and productive almond tree,* the aromatic gum, and the palm, ranging from the highest to the lowest, from the royal to the smallest. Hidden riches exist in these lands, grateful and filled with perfume, gums and wax abundant and varied. Here are found cabinet-woods, medicinal plants, and products rich and appreciable, and many other valuable productions, without mentioning the great mineral wealth of the district.

"Finally, I conclude charging you that you pray to heaven, and do all within your power on earth with reference to your calling, that so many souls shall not remain forgotten and such beautiful lands remain uncultivated."

This calls vividly forward the subject of Paytiti, which, during the Spanish occupation of America, inflamed the imagination of Europe, and caused the organisation of many brave expeditions, which penetrated into the heart of South America in search of Paytiti, Manoa, and Omasuyos. No doubt this is the nearest approach to Paytiti that has ever been discovered; but I am inclined to believe that the advancement in ideas and customs, described by the good Padre Fidel, is the result of causes which, however traditional, have still some foundation in fact. It will be remembered that the cruelties of the Spaniards drove large numbers of the Ynca race to the forests of the Amazon, and especially to the east of Cuzco. Some of the Spanish rebel followers of the younger Almagro probably escaped into the Caravaya district in 1542.

When the Chunchos sacked the towns of San Gavan, Sandia, and San Juan del Oro, to the east of Cuzco,

* What a pity to disturb these tribes with "civilisation."

* Probably the Brazil-nut, which is called an almond in Northern Bolivia.

they probably carried most of the Spanish women to the forests, in the same way that the Jibaros did in their terrible uprising in South-Eastern Ecuador in 1599, and their destruction of Savilla del Oro and other populous towns. Juan Alvarez Maldonado* may have left many stragglers in his search for the 40,000 escaped Ynca Indians, east of Cuzco, beyond the Tono, where he had the three days' bloody battle with the rival expedition of Tordoya. The Spanish blood, mixed with that of the fraction of the Ynca race for nearly three centuries, may have given to the Tacana tribes we have described a claim to superiority.

It was on the Tono† branch of the Mayu-tata that the Ynca Yupanqui, formed a settlement of the Indian tribes he conquered in his great military expedition to the east of Cuzco into the Beni and Mojos districts.

Lieutenant Gibbon of the U.S. Navy descended the mountains from Cuzco to the junction of the Tono and Piña-Piña. He found it to be 12° 32′ S. latitude, and 70° 26′ W. from Greenwich, and 1337 feet above the level of the sea. The river was 70 yards wide, but not navigable at this point. The Peruvian bark gatherers told him that, a short distance below, the river wound through a level country.

The farthest point reached by Chandless on the south branch of the Purûs was barely 40 yards' average width. He does not give its elevation, but the elevation of the point where the Purûs forks, 1792 miles up, he gives at 1088 feet, that is 249 feet lower than the point on the Mayu-tata reached by Gibbon.

The Madeira river, from the fall of San Antonio to its mouth, runs north-east, and the Purûs runs parallel with the Madeira for this distance. A right line drawn north-west from the fall of San Antonio cuts the Purûs at a point which I estimate by Chandless's measurements to be about 300 feet above the level of the sea. San Antonio is 202 feet, and the mouth of the Madeira 90 feet above the sea, according to Keller. This indicates that the Purûs from the point named runs through a valley more elevated than that of the Madeira below the falls, but with a greater incline towards the Amazon than the Madeira valley, although the numberless curves of the Purûs give it a gentler current than that of its sister stream.

The level of the upper fall of the Madeira is, according to Keller, 474 feet above the sea. This may be roughly estimated to be the level of the mouth of the Mayu-tata. This gives a difference of level of 863 feet between the point where Gibbon visited it and its entrance into the Beni, a length of river which will probably be found to measure at least 600 miles.

In comparing the relative elevation of the Upper Madeira Valley and the Upper Purûs, the mouth of the Mayu-tata, 474 feet high, corresponds with the mouth of the Aquiry, 364 feet high; and the Upper Purûs, from the point named, runs approximately parallel with the Mayu-tata. If these hypsometric observations are correct, they show that while the Lower Madeira is less elevated than the Lower Purûs, the falls of the Madeira make a distinct change in the relative elevation of both rivers, for the Mayu-tata branch of the Madeira runs along the north-western edge of a plateau higher than the valley of the Upper Purûs.

We have shown that the Lower Purûs is more elevated than the Lower Madeira, and the Upper Purûs less elevated than the Upper Madeira. A profile line of the Purûs would cut the profile line of the Madeira and its Mayu-tata branch at a point among the falls of the Madeira.

This question of the comparative elevation of the valley of the Madeira and that of the Purûs has been long in dispute among geographers.

There are few more delicate problems in hydraulic engineering than the ascertaining of the exact inclination of the surface of a great river, and few rivers of the world have been scientifically studied in all that relates to their tides, currents, sectional areas, and inclinations of surface and bottom. No river offers so magnificent a field as the Amazon for the study of river hydraulics.

There have been absolutely no scientific examinations of the Rivers Amazon, Madeira, and Purûs; and in the effort to determine the inclination of their surfaces, for the purposes of relative comparison, one is reduced to the measurements of the few explorers who have given us the results of the usual rough methods of ascertaining heights by the boiling point of water and the barometer. The various sectional profiles made by travellers across South America, by way of the Andes and Amazon, or *vice versâ*, show, when placed in comparison, an utter confusion of elevations —some of them sufficient to give the Amazon river a current of 10 miles per hour for the first thousand miles of its course above the sea.

Among the giant streams of the Western continent, the Parana appears to be the only one which has been measured with practical accuracy, and this for a distance of only 200 miles from the sea. This was done by Revy, by means of the current thrown back

* It is stated by Alvarez Maldonado (who made an expedition in these distant regions shortly after the conquest), in an old record still preserved at Cuzco, that on the subjugation of the country and dethronement of the Yncas, about 40,000 Ynca Indians emigrated from Cuzco and its neighbourhood, traversed the valleys of Paucar-tambo, and penetrated east of the Amaru-mayu; that they established themselves in a colony on the banks of a great lake called Paytiti, were governed by a chief called the Apu-Huayri, and were then a great people. These facts are, in all likelihood, the sources from which Sir Walter Raleigh drew his fabulous account of the golden city of Manoa, which was also said to be on a great lake." *Cuzco and Lima*, C. R. Markham.

† Markham, in May of 1853, descended the mountains from Cuzco to latitude 12° 41′ S. and longitude 70° 30′ W., 103 miles from Cuzco. He says, "Near this point the Tono, with all its tributaries from the west, the Cosnipata from the south-west, and the Piña-piña from the north, having drained the wide forests of Paucar-tambo, unite and form that mighty river which I saw from a distance, and which is here called the Madre de Dios or Amaru-mayu river, evidently the same as the Purûs."

It was very natural for Markham to suppose at that time that he was on the head-waters of the Purûs, for Chandless had not then explored the Purûs, and shown that its sources were a hundred miles to the north of where Markham then stood. Markham continues:—"If once the Madre de Dios or Purûs was thoroughly explored, the effects it would have on the industry and future prospects of Peru are incalculable The people of the interior of that beautiful country, the Ancient Empire of the Yncas, would at length succeed in turning the granite barrier of the Andes. . . . . An inland navigation would waft the varied productions of the interior of Peru—its bark, sarsaparilla, copaiba and india-rubber, its sugar, cocoa, cotton and tobacco, its alpaca, wool, silver and precious stones—by a direct and easy route to the Old World, and the dangerous journeys across the Cordilleras, and long tedious voyages around Cape Horn would be avoided."—*Journal of the Royal Geographical Society*, 1854, vol. xxv., p. 158; paper by C. R. Markham, F.R.G.S.

by the tidal wave of the Atlantic.* It gave a result of $\frac{44}{100}$ of an inch per mile as the surface inclination.

With a 14-inch levelling instrument, and staff and pegs, Revy practised a most accurate levelling operation on a 4800 feet length of the Paraná, above all tidal influence. The result gave no perceptible difference of level between the two points, owing to the slight ripple on the calm river and its unsteady surface.

It is doubtful if the Amazon be found to have a greater inclination than half-an-inch to the mile, between Manaos and the Atlantic, a length of 1000 miles. The elevation of Manaos above the sea is given:

By Herndon	at	1475 feet.
By Spix and Martius	,,	556 ,,
By Orton	,,	199 ,,
By Ozevedo and Pinto	,,	92 ,,

The last-named would give $1\frac{1}{10}$ inch fall to the mile. Keller's observation of 90 feet elevation at the mouth of the Maideira would give $1\frac{2}{10}$ inch. The observation of Chandless, 590 miles up the Purûs, and 1700 miles from the sea, gave an elevation of 107 feet, or an average between that point and the sea of $\frac{75}{100}$ of an inch per mile.

At Tapajos, Bates observed the effect of the ocean-tide on the Amazon 530 miles from the sea. The rise of the tide at Pará, 70 miles from the sea, being but 12 feet, shows clearly that all the estimates giving to the surface of the Amazon an incline of even an inch to the mile are very excessive.

I have endeavoured, on this point of the fall per mile of the Amazon, to show that no absolute dependence can be placed upon the accuracy of the elevations given to us by the various explorers of the Madeira, the Mayu-tata, and the Purûs. My inferences relative to the important question of the comparative elevation of the valleys of these rivers are necessarily rude ones, but I am led to believe that the data upon which they are based is sufficiently correct to warrant them.

Explorations will probably show the Mayu-tata river to have falls and rapids for many miles of its course below the point which Gibbon or Markham reached, and that it would hardly be safe to suppose that it is navigable for steamers to a point nearer than 150 miles from Cuzco in a straight line.

Over this route, to the valley of the Mayu-tata, one naturally expects to see the Mollendo, Puno, and Cuzco Railway extended by the Government of Peru, if ever Peru expects to make the existing railway a financial success. The connection of this railway with a navigable point on the Mayu-tata river would be of inestimable value to South-Eastern Peru. Gibbon, in speaking of this river, says: "If it is navigable for steamboats to where we now see, it forms the natural highway to Southern Peru. All the silver and gold of Peru are not to compare with the undeveloped commercial resources of that beautiful garden."

The foot-hills of the Andes will probably be found to push themselves far down between the Purûs and the Mayu-tata. In my descent of the falls of the Madeira, I noticed short ranges of hills as well as some isolated ones of magnitude.

I have treated the subject of the Purûs at some length, for the reason that, in Bolivia as well as abroad, many have jumped at the conclusion that this river would afford a better avenue of communication with Bolivia than the River Madeira. On account of the data given and much other information which might be elaborated, I believe the Purûs to be totally unserviceable for Bolivian commerce. It would probably take at least a hundred miles of road to connect the head of navigation on the Aquiry branch of the Purûs with the Mayu-tata river. The Beni river would then be reached among the rapids near its mouth by descending the Mayu-tata, and still commerce would be cut off by rapids from the great Mamoré, Guaporé, and other streams which penetrate to the populated centres of Bolivia. An analysis of the Purûs route shows that it cannot be of use to Bolivia for many years to come, and then only to tap the extreme north-western frontier of the country.

The proper route to reach the valleys of the Beni and Mayu-tata is to cross the Mamoré river just above the mouth of the Beni, with a railway branching from the projected Madeira and Mamoré line, and, skirting the bank of the Beni front of the mouth of the Mayu-tata, terminate the road at the upper rapid of the Lower Beni. Such a branch line would not be more than thirty to forty miles in length, and would open two river valleys, the equals of which in richness of soil, agricultural, medicinal and mineral products have no superiors upon the western continent.

George Earl Church, F.R.G.S.

* *Vide* the *Hydraulics of Great Rivers, by* J. J. Revy.

INDIAN MARINE SURVEYS, 1874-6.

The Department of Indian Marine Surveys has been officially organized during the latter year under review, and the provision of this most necessary work may therefore be said to be now permanently secured.

According to a resolution of the Government of India, published in the *Gazette*, the duties to be discharged are as follows:

Systematic surveys of the coasts of India are to be carried on with suitable vessels efficiently equipped and manned. These surveys are to be connected with the shore surveys, and closed in on points already fixed by the Great Trigonometrical Survey. The original surveys of ports, harbours, and river entrances will be photozincographed, and issued for local navigation and engineering purposes, and from them charts of the coast will be compiled on a medium scale for the purposes of general navigation. Copies of all original surveys will be forwarded to the Admiralty Hydrographer for publication; and all corrections of surveys and other information, such as notices of changes in the places of buoys, lights, &c., will also be transmitted at once to the same office. A catalogue of all the charts of the Department will be kept, besides a sufficient stock of Admiralty charts, and copies of these will be furnished to the Local Governments and public officers on demand. The Superintendent of Marine Surveys is also charged with the duty of compiling an annual chart of wrecks, an annual list of lights, with descriptions of them and their position, and sailing directions for the Indian coasts. He will report on the lighting and marking of the sea approaches to all great Indian ports and rivers; suggest improvements in harbour conservancy by means of buoys, beacons, and lights, and in the navigation of rivers throughout India. Any extracts from log books

of vessels belonging to the Bengal and Bombay Marine, or to H.M.'s Squadron, which bear upon any discoveries, dangers, or errors in the charts of the Indian Seas, will be communicated to the Department of Marine Surveys, which, like all the other branches of the Survey, is affiliated to the Department of Revenue, Agriculture, and Commerce.

The foregoing describes the nature of the duties. The agency by which they are to be discharged consists of a Superintendent (Commander A. D. Taylor, late I.N.), two Deputy Superintendents, and nine Assistant Superintendents, three executive officers, one Medical Officer and Naturalist, and a Superintendent of the Drawing Branch. The five surveying officers next in rank to the Superintendent belong to the Royal Navy, their services having been lent to the Indian Government by the Admiralty. The whole cost of the Department does not exceed two lakhs of rupees or 20,000*l.* per annum.*

The first general report on the operations of the Marine Survey of India was issued by the Superintendent, Commander Taylor, in the latter part of December 1876. It commences with a retrospect of the preliminary steps from 1871 to 1873 which led to the deputation of Commander Taylor to India in the latter year. It touches upon the proposals of the Government of India for securing efficient surveys and charts, the measures taken in England to obtain qualified surveyors, and the final departure of Commander Taylor and the officers selected for service under him in December 1874.

The vessels chosen for the Marine Survey operations were at that date as follows:

The 'Clyde' (steamer) and the 'Constance' (schooner) had been fitted at Bombay for surveying purposes, and the 'Guide' (brig) and the 'Lady Lawrence' (schooner) had been selected by the Kidderpore dockyard authorities for the same service. The last-mentioned vessel, however, could not carry a steam-cutter, and was unsuitable for chart work, so was retransferred to the Marine Department. The 'Clyde' eventually proved to be almost useless under sail, and the 'Guide' to be so affected by dry rot as to be unseaworthy and not worth repairing. These disappointments have caused much delay, and have necessitated the provision of a new steamer, which is eventually to be constructed in England.†

Notwithstanding the lack of vessels, the Department has been able to accomplish much valuable work. Mr. Chapman, late I.N., in the 'Constance,' made a plan of Kolachul Harbour and surveyed the Enciam Rocks in Travancore, charting 6 miles of coast and 5½ square miles of water. He then rounded Cape Comorin, passed through the Paumben Pass, obtained additional soundings in Palk Strait, and verified those on the published charts, and then proceeded to Coconada, where he commenced the survey of the Bay, till relieved by Lieut. Hammond and Sub-Lieut. Petley. This survey was completed on the 24th August. It comprised 79 square miles of water and 42 miles of coast, charted on a scale of 2 inches = 1 nautical mile. The survey has since been republished by the Admiralty Hydrographer. Regarding the question of the lighting of the port of Coconada, Lieut. Hammond considers that two new lighthouses are required; one of the first order dioptric, with a radius of 21 miles, on Point Gordeware, and another for Coconada Harbour of the third order dioptric, to show at a distance of 10 miles, and to be erected 4½ miles S.S.E. of the present lighthouse.

On the 8th April the 'Guide,' under the command of Navigating Lieut. J. E. Coghlan, proceeded down the River Hooghly, and surveyed the dangerous James and Mary Shoals, Luff Point to Anchoring Creek, including the entrance to the Roopnarain River, on the scale of 10 inches to the nautical mile (this being subsequently reduced for publication by photozincography to 6 inches to the mile). The chart is a valuable one for record, and Captain Taylor remarks that if the whole of the river from Chandernagore were annually surveyed in the same way, a comparison of the results would be most invaluable in carrying out engineering works for the improvement of the conservancy of the river.

Staff-Commander Ellis, R.N., in the 'Clyde,' had in February connected by meridian distance Pigeon Island with one of the Laccadive group, in his voyage from Bombay to Calcutta. He was also enabled to make an examination of the channel into Mootapetta Bay (Port Lorne), the soundings near which differed considerably from Captain Powell's survey in 1837. The dredging and blasting operations in Paumben Pass are still continued. A depth of 11 feet 9 inches had then (March 1875) been attained, and it was confidently expected that the Pass would soon be available for vessels of 14 feet draught.

Survey operations along the Burma coast were commenced in November 1875, by Lieut. Jarrad, in the 'Clyde,' examining the approaches to the Rangoon River. The erection and maintenance of a tide-pole was a matter of great difficulty, owing to native boats fouling it, and the great strength of the tidal streams. Commander Taylor considers the establishment of a self-registering tidal gauge there very desirable. This important survey was completed on the 8th March, and comprised 37½ miles of coast, trigonometrically laid down, and 216 square miles of water examined. In consequence of a discrepancy in longitude discovered in the compilation of the sheet, including the coast of Tenasserim and Singapore and Penang, the meridian distance between Elephant Point Obelisk, which has been determined by the Great Trigonometrical Survey, and Amherst, was astronomically measured. The result proved that the position of Amherst on Admiralty Chart No. 823 is 4½ miles too far west. Commander Taylor intends to have observations made next season at Diamond Island, off Cape Negrais, and Amherst, for the same purpose, and there would then be three principal points in the Gulf of Martaban fixed astronomically. These measurements of meridian distances are of great im-

* The Department consists of the following officers:—Commander A. D. Taylor, I.N., Superintendent; Staff-Commander J. H. Ellis, R.N., Deputy Superintendent, 1st Grade; R. C. Carrington, Esquire, Superintendent of the Drawing Branch; Navigating Lieutenant F. W. Jarrad, Deputy Superintendent, 2nd Grade; Navigating Lieutenant G. C. Hammond, R.N. (one vacancy), Assistant Superintendents, 1st Grade; Navigating Lieutenant E. W. Petley, R.N., Mr. M. Chapman, Lieutenant W. H. Coombs, R.N. and Navigating Lieutenant T. C. Pascoe, R.N., Assistant Superintendents, 2nd Grade; Mr. P. J. Falle (one vacancy), Assistant Superintendents, 3rd Grade; and Dr. J. Armstrong, B.A., Surgeon and Naturalist.

† The Asiatic Society of Bengal have requested Government to have this vessel constructed with appliances for deep-sea dredging. This request is now under consideration.

portance, as the whole of the eastern side of the Bay of Bengal has been very incorrectly laid down on the Admiralty Charts, an error of from 5 to 8 miles sometimes existing.

After obtaining some prolific dredging between Diamond Island and Akyab, the 'Clyde' commenced the survey of that port on the 21st March. Much time was spent in clearing the hill-tops of jungle, owing to the independent character of the Burmese, and the difficulty, through want of an interpreter, of communicating with them. On the night of the 30th March, Navigating Sub-Lieut. C. George, R.N., was suddenly seized with cholera, which had been rife for some time among the native population; and though everything possible was done to arrest the progress of the disease, the unfortunate young officer died at noon on the 1st April. Lieut. George was a son of Staff-Commander C. George, R.N., Map Curator to the Royal Geographical Society, and a young officer of much promise. Owing to the threatening prevalence of the disease, Commander Taylor, who was on his way down the coast of Burma on a visit of inspection, ordered Lieut. Jarrad to leave Akyab. The 'Clyde' accordingly proceeded northwards, and tested the correctness of the coast between Cheduba, and Kyouk Phyou, as shown on Admiralty Chart No. 821. Lieut. Jarrad reports it to be roughly laid down and out of bearing when referred to Cheduba Island. The published plan of Kyouk Phyou proved to be so incorrect that arrangements were made for the survey of the port to be continued the ensuing season.

The 'Constance,' under the command of Lieut. Hammond, left Calcutta in December 1875 for the purpose of making a plan of the anchorage of False Point on the Orissa coast. In spite of many mishaps with the steam-cutter, the survey was completed by the 9th March. The anchorage was charted on the 6-inch scale, the coast for 5 miles to the south and 10 miles to the north was surveyed on the 3-inch scale, and the soundings extend to from 5 to 8 miles off shore. Lieut. Hammond then proceeded to the northern portion of the shoal off Dhumrah River, where he measured a base, and proceeded to sound the shoals. Unfortunately, work was completely stopped by a heavy gale, and a great number of the crew falling sick compelled Lieut. Hammond to return to Calcutta, whence he proceeded to England on medical certificate.

During the months of April and May 1876, Commander Taylor made a tour along the eastern coast of the Bay of Bengal, and inspected the ports of British Burma. He visited first Akyab and Moulmain, and then proceeded to Amherst. This port has never been properly surveyed. The late Mr. Pearson, of the Bengal Marine, examined the Moulmain River in 1865, but no steps were taken to have the Admiralty Chart corrected by the survey. Commander Taylor is of opinion that no large port of British India requires so much to be properly surveyed and mapped, and has accordingly arranged for Lieut. Jarrad to commence next season's work at Amherst. The Admiralty Chart of Tavoy proved to be dangerously erroneous; and the British India Steam Navigation Company's steamer 'Mahratta,' when navigating by it, struck on a rock in Tavoy River. Subsequently, Captain Taylor discovered a copy of the survey of Tavoy, executed by Lieut. R. Moresby, of the Bombay Marine, in 1824, and published by Horsburgh in 1827, which is far superior to that issued by the Admiralty. Captain Taylor proposes to issue amended charts of Tavoy, Mergui, Pakchan, &c. After visiting Mergui he turned his attention to the passage from Mergui to Pakchan, which urgently needs sailing directions—none of which at present exist. He proposes to issue these in the form of hydrographic notices, explanatory of the normal trading route between Moulmain and Pakchan, touching at Tavoy and Mergui, with some useful remarks on the extended voyage along the Siam coast to Penang. Below Pakchan, Commander Taylor has made a sketch showing the soundings in the entrances to Kopah, which has great tin mines like most of the ports along the Siam coast, but no trace of such a fine river as depicted on the Admiralty Chart. A new chart of Kopah is now in preparation. Of Junk Ceylon or Salang a pretty good survey was obtained from Captain Richelieu, commanding the Siamese Royal gunboat 'Coronation.' This officer was trained in the British Royal Navy, is a good observer, and most intelligent in surveying the coast and islands. The actual survey of this island differs immensely from the published one, and the corrected charts will be a great boon to the British Indian Steam Navigation Company and the coasting trade.

The Superintendent of Marine Surveys has been consulted by Government on a variety of marine questions of great importance. Among these may be mentioned that of the reorganisation of the River Hooghly Survey, on which an exhaustive report has been submitted by him. Commander Taylor is of opinion that an elaborate scientific survey of the whole tidal basin of the Hooghly River, at least from Chandernagore to the Sand Heads is required, as well as an accurate series of levels from Calcutta to below Diamond Harbour.

During the year under review a valuable list of lighthouses and light vessels in British India, including the Red Sea and coast of Arabia, has been issued by the Marine Survey Department. The list is in the form of a handbook, giving in tabular order the lights, with their names, latitude and longitude, colour, radius of illumination, height, and other particulars. This little book will be a most useful aid to navigation. It has been compiled by Mr. R. C. Carrington.

The programme of work to be undertaken by the Marine Survey Department during the season of 1876-77 was as follows: The 'Clyde' was to leave Calcutta in November, call at Diamond Island (Bassein River), and connect the same astronomically with Rangoon and Amherst Pagoda, and then proceed to survey the approaches and entrance to Moulmain River, on a 2½-inch scale. After that the 'Clyde' was to examine the entrance to the Sandoway River, and then to complete the survey of Akyab Port—a task which will probably occupy two months.

Commander Taylor proposes himself to visit first the Mergui Archipelago, in which trip he is to be accompanied by Dr. Armstrong (the opportunities for research in natural history and geology being very promising in these islands), and then to inspect all the ports on the Coromandel Coast, with a view to satisfying himself regarding their requirements as far as regards lighting, buoying, &c. This programme has received the sanction of the Government of India.

Reviews.

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THE VATNA JÖKULL.*

FOR one thousand years, since Iceland was first colonised, the region of the Vatna or Klofa Jökull remained unexplored. This vast tract of ice and snow, exceeding in extent 3000 square miles, appears to us to have this peculiar interest, that it is a key wherewith to unlock the unexplored and unexplorable interior of Greenland. We find the Vatna Jökull to be a plateau (all valleys being filled up with ice) which receives yearly vastly more snow than is wasted by melting or evaporation; its level is probably rising, and it is certain that the icy formation is continually extending outwards. This was shown as long ago as 1814 by Henderson, and Mr. Watts gives positive proof of this extension both to the north and south, although the Icelanders are unwilling to admit it. Such a vast mass of ice affects the climate in its vicinity, and thus by its power of refrigeration helps its own growth. The best opinion is that the interior of Greenland is one vast glacier, and observation shows that the ice of the interior is encroaching on the coast. We may very well judge what that interior is from Mr. Watts's description of the plateau of the Vatna Jökull. The few attempts that have been made to penetrate inwards from the coasts of Greenland confirm this view.

"The Vatna Jökull comprises by far the most important mountain section in Iceland, and a far greater area is covered by its snows than could be occupied by the sum of all the remaining snow-clad mountains in Iceland. As may be supposed, perhaps half the river-water of Iceland flows either directly or indirectly from the Vatna Jökull, either issuing in torrents from the extremity of its glaciers, or, after filtering for long distances through the loose and cavernous ground, appearing as land-springs at a lower elevation."

This mysterious region has hitherto been guarded from invasion by the terrors of the elements, and the spells cast around it by Icelandic legend and superstition. Mr. Watts has been the first to face the fury of the horrible gales which sweep over its icy surface, and to encounter the wind "Trolls" howling and shrieking in the storm, with whom old Icelandic story peoples a district "destitute alike of animal, insect, and floral life."

An old Icelandic traveller, he had in the preceding year made arrangements for his expedition, and engaged a party of five Icelanders to accompany him. His equipment much resembled that for a Polar sledging expedition, except that Mr. Watts prefers for a prolonged sojourn in wet snow a large sleeping bag 8 feet long and 5 feet wide, open at both ends, for three to sleep with their heads one way, and three with their heads the other. The course selected for the passage of the Vatna by our traveller lies to the west of the plateau, about 17° 20′ W. longitude, starting a little to the west, and emerging somewhat to the east of this line. He started at the end of June and spent twelve days on the snows of the Jökull; for a third part of this time progress was absolutely impossible, from the frightful storms which raged over this elevated region. Every variety of bad weather was experienced, fog, rain, sleet, snow, and wind; in this short time snow fell in such abundance, that in one night the tent was buried several feet by morning. The lowest temperature registered was +13°, the reader will remember that this was at the period of the longest days. The softness of the snow made travelling very exhausting, and even in these twelve days two of the men suffered in health, one from spitting blood, the other from severe pains in the stomach. It is clear from the difficulties encountered in this expedition, that any attempt to penetrate into the interior of Greenland to any real distance is utterly hopeless.

We have confined ourselves to the Vatna and the passage across it; but we promise our readers much interest in the rest of this gallant traveller's adventures in Iceland, his explorations in the district which lies between the Vatna and the Lake of Myvatu, and his return journey across the island by the Sprengisandr; as well as in his observations on the sulphur mines, and the climate and geology of Iceland. He gives us an uncomfortable hint that the Gulf Stream is being gradually deflected in a southerly direction, and so a glacial epoch is gradually creeping downwards!

Mr. Watts deserves credit for compressing into 200 pages matter which many travellers would think entitled them to a couple of volumes.

* *Across the Vatna Jökull; or, Scenes in Iceland;* being a description of hitherto unknown regions. By William Lord Watts. London (Longmans & Co.), 1876.

CURRENT-CREATING ACTION OF VIS-INERTIÆ IN THE OCEAN.*

MR. JORDAN, in the present small volume, points out to what extent recent oceanic explorations have confirmed the theory of the current-creating action of *vis-inertiæ* in the ocean, which he explained ten years ago.

"The theory of *vis-inertiæ* shows that that force is universal gravitation. The water of the ocean tends to maintain its state of rest in the position in which the gravitation of the universe tends to hold it. And as the property of *vis-inertiæ* inherent in any given particle of matter is the combined action of the gravitation of every other particle of matter; therefore, when the earth moves, there is caused a conflicting action of different forces of gravitation in the ocean. Whilst terrestrial gravitation carries the ocean along with the earth, all other forces of gravitation (to which the term *astral* gravitation has been applied) tend to keep it in its former position.

"Under this conflicting action, the particles of the ocean least firmly held by the force of terrestrial gravitation—which are those about the surface of the deep and central parts of the ocean—tend to flow in the opposite direction to that of the earth's motion; whilst counter-currents tend to flow along the shores and bottom of the ocean, where the relative action of astral, as compared with terrestrial, gravitation is less."

In the year 1866 Mr. Jordan published a chart showing the action of *vis-inertiæ* as regards currents; and his present publication is intended to show the extent to which recent researches in the depths of the ocean have tended to confirm this view, as distinguished from Dr. Carpenter's theory that the circulation of currents is caused by differences of temperature, according to which the cold water must be below the warm water all the way to the Arctic Regions.

* *Remarks on the recent Oceanic Explorations, and the Current-creating Action of Vis-inertiæ in the Ocean*, by William Leighton Jordan, F R.G.S. (Hardwicke, 1877), pp. 47, with chart and diagrams.

For Dr. Carpenter's view is that the warm water flows along the surface of the ocean to those regions, and *because* it gets chilled there it sinks down to return southwards as an under-current. But the theory of *vis-inertiæ*, according to Mr. Jordan, makes the water sink downwards in the temperate regions; and a part of the water which comes along the surface of the ocean from the equator to the temperate regions, then sinks downwards and flows along the bottom of the ocean to the Arctic Regions whilst in some places cold water flows southwards above it.

It will be remembered that when Mr. Leigh Smith made his voyage to Spitzbergen in the 'Samson,' in 1871, he took soundings in 81° 24′ N., finding the water at the surface at a temperature of 33°, while at 300 fathoms it was 42°. The same fact was observed by Captain Scoresby in 78° N. He found the surface 32° and the water at a depth of 760 fathoms 38°. In 1872 Leigh Smith obtained a similar result. In 80° 17′ N., he found the temperature of the water gradually increasing to 64° at a depth af 600 fathoms. These observations exactly coincide with the pre-asserted action of *vis-inertiæ*, and are as exactly at variance with the temperature theory.

In his chart of the Arctic regions, published in 1866, Mr. Jordan showed a circulation eastwards all round the shores of the Arctic basin, but that also the bottom-water is forced upwards to the surface along the shores of the eastern hemisphere, and from that coast it sets across the ocean to the shores of the western hemisphere. The existence of such a surface-pressure from the eastern to the western hemisphere is corroborated by the constant packing of the ice against the latter coast. Sir George Nares found the ice, which was slowly moving eastwards, being at the same time constantly packed against the coast by pressure from the north.

Mr. Jordan further says that the evidence from all Arctic expeditions goes to show that ice-floes are being constantly torn away from the shores of the eastern, and packed against those of the western hemisphere. But for this surface-pressure from one coast against the other coast, those ice-floes would continue to be ice-floes, instead of being piled up into the formation of floe-bergs. The Polar pack is not formed in narrow channels, but in the wide expanse of the Polar Sea. It is not in narrow channels, nor even on shores which appear to be those of narrow seas, but on shores which the evidence all indicates to be the shores of a wide oceanic area; it is in that Polar Ocean, or Palæocrystic Sea, that the floe-bergs are formed and packed against the coast.

Mr. Jordan then refers to recent corroborative evidence in favour of the *vis-inertiæ* theory as regards the temperate and equatorial regions of the ocean, and thus concludes:—"The distinct manner in which the current-creating action of the earth's rotation has been confirmed by facts brought to light since the publication of the theory of *vis-inertiæ*, must be regarded as strong, though indirect, confirmation of the indications of the existence of a current-creating action of the earth's onward motion through space."

Ostriches and Ostrich Farming. By *Julius de Mosenthal* and *James Edmund Harting*. With Illustrations. (Trübner, 1877.)

This is an interesting little monograph on the *Ratitæ*, struthious, or ostrich-like birds, and the portion of the book which has interest for us is that which discusses their geographical distribution.

The *Struthio camelus*, or African Ostrich, has the largest range, being met with in North and South Africa, Syria, Arabia, and Mesapotamia, while its fossil remains were found in the Sewalik Hills. It is mentioned twelve times in the Bible, in some passages the word being rendered "owl" in our version, by Strabo and Herodotus, and in the anabasis of Xenophon. Wellsted mentions the ostrich as being seen on the route between Hit and Damascus; Palgrave says it is not uncommon in the Hedjaz. But ostriches are certainly becoming rarer and rarer in Asia, and they are now extinct on the route to Suez, where Burckhardt saw them in 1816. They are, however, common in the Somali country, and Cameron speaks of them in Ugogo and Unyanyembe. Ostriches will run at a rate of twenty-six miles an hour, their stride being from twenty-two to twenty-eight feet, and Dr. Haughton has given a most interesting account of the muscular mechanism of the ostrich's leg.* In Morocco the Arabs dash after the ostriches on horses at full speed; in Arabia the bird is stalked and killed while sitting.

In 1834 the quantity of ostrich feathers exported from South Africa was 38,216 lbs., worth 519,540*l*. The best feathers of all, but they are very rare, come from the Syrian desert. The value of the ostrich feathers exported from Egypt is 250,000*l*., from Barbary 100,000*l*., Mogadore 20,000*l*., and Senegal 300*l*.

The *Rhea* is the American ostrich, having the head and neck feathered, no tail, and three instead of two toes. There are three species, the *Rhea Americana*, ranging from the Straits of Magellan, all over Patagonia, to Paraguay, and South Brazil; the *Rhea Darwini*, of Southern Patagonia; and the *Rhea Macrorhynchus*, described by Dr. Sclater, the habitat of which is doubtful. The chase of the ostrich in Patagonia is admirably described by Captain Musters; and this chase is a most remarkable instance of the rapidity with which a complete change may be made in the habits and methods of a whole race. When Magellan's fleet was on the coast of Patagonia, Pigafetta tells us that the natives were accustomed to stalk the ostriches, approaching them covered with ostrich skins and feathers, and using bows and flint-headed arrows. Soon afterwards horses were landed in the Rio de la Plata, and very few years had elapsed before the Patagonians had entirely changed their habits and mode of life—were all mounted, and, instead of stalking, ran the ostriches down, and caught them by hurling *bolas* or lassoes. In 1874 sixty tons of ostrich feathers were exported from the Argentine ports, worth $132,689. Several experiments have been made in rearing American ostriches in Europe, under the auspices of the Société d'Acclimatation.

Mr. Harting also gives an account of the various species of Australian cassowary, which has three toes, the head bare with a horny helmet, neck bare and bright coloured, and neck with wattles; and of the emus, which have feathered heads and no helmet; as well as of the kiwi or apteryx.

The second part of this interesting little book is devoted to an account of the system of ostrich farming in South Africa, by M. Mosenthal. In 1865 there were only eighty tame ostriches in Cape Colony, while in 1875 there were 32,247; a convincing proof that ostrich farming is not an unprofitable speculation. The requirements are free space and good fences, 600 acres being required for eighty birds. There are ninety to one

* *Proceedings of the Royal Irish Academy*, ix., p. 50.

hundred feathers to a pound, and a full-grown male will yield a pound, worth from 42*l.* to 50*l.* at Cape Town. Second class feathers are worth 20*l.* to 30*l.*

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THE LACCADIVES AND THE WEST COAST. Article by *A. O. Hume, Esq., C.B.*, in the number of "Stray Feathers" for January 1877.

"STRAY FEATHERS," the Ornithological Journal in India, edited by Mr. A. O. Hume, C.B., the Secretary to Government in the Department of Revenue and Agriculture, as a rule, contains matter which is strictly ornithological; but the various branches of science often dovetail and supplement each other, and the January number of "Stray Feathers" has some geographical notes of much interest. In February 1875, Mr. Hume visited the Laccadive Islands in the 'Clyde,' an old gun-boat that had been fitted out for the use of the Indian Marine Survey Department.

Mr. Hume's main *geographical* object in his tour to the Laccadives was to ascertain whether this group was separated from India by a deep trough; but his paper also contains an account of the islands, and of their population, as well as an exhaustive descriptive enumeration of their *avifauna*. The cruise of the 'Clyde,' on this occasion, established that the Laccadives are divided from the mainland of India by a deep trough not less than 1300 fathoms in depth, and possibly considerably more; that they have no distinctive fauna or flora, no mammals except the common Indian *mus rufescens*; no land-birds except a very few of the commonest Indian species, and no non-Indian plants. Mr. Hume observes that the majority of the species of plants possess, according to native ideas, medicinal properties, and are therefore just those which are most likely to have been introduced by human agencies. He sees ground for suspecting that the northern members of the group have undergone a period of subsidence since the coral, of which they mainly consist, was formed, the subsequent elevation not having been sufficient to allow the re-emergence of those islands now represented by the great banks of Padrio, &c. He adds, "Probably the subsidence was greatest to the north, and not improbably it was connected with the volcanic agency which we know to have been in operation scarcely more then half a century ago in the Runn of Cutch, which is due north of the Laccadives."

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NOUVEAU DICTIONNAIRE DE GEOGRAPHIE UNIVERSELLE. Par *Vivien de St. Martin*. 1re fascicule. (Paris, Hachette, 1877.)

SIMULTANEOUSLY with their new atlas, Messrs. Hachette are bringing out a gazetteer of the world, to be published in about forty bi-monthly parts of eighty folio pages. The author has spent no less than sixteen years in the collection of materials for this elaborate work. He has aimed at producing a trustworthy book of reference, and, as far as we are able to judge from a perusal of about fifty articles, he has succeeded. The physical geography of the various countries is treated with much detail, and special attention has been paid to ethnological subjects, which most of our gazetteers, confining themselves as they do to the names of localities or districts, neglect almost altogether. It is only natural that France and French Colonies should occupy a prominent position in a work principally written for French readers, but other countries are not neglected on this account. Thus, on the first few pages, we meet with the following articles referring to the British Isles:—Abbey, Abbots Bromley, Abbotsbury, Abbotsford, Abbots Hall, Abbots Langley, Abbs Head, Abdie, Aber, Aberaeron, Aberavon, Aberbrothock, &c. The Gazetteer is evidently the result of serious labour, and we hope its aged author may be granted health to complete it.

Cartography.

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OFFICIAL EUROPEAN CARTOGRAPHY IN 1875-76.—In the following lines we propose to notice the principal publications of the Continental Topographical Departments, as far as they have become known to us:—

GERMANY, though united now under an emperor, cannot yet boast of a Topographical Office, extending over the whole of the Empire, and the various states continue the publication of their maps as they did before, there being neither uniformity of scale nor of system.

In PRUSSIA some progress has been made with the new edition of the map of the eastern half of the kingdom, as well as with its western continuation on the same scale. Eight sheets of the former and seven of the latter were published in 1875 and 1876.* The maps are neatly engraved on copper, and leave nothing to be desired as regards clearness and technical execution. They are utilised in the production of District Maps (Kreiskarten), many of which have been issued since 1875. The publication of the plane-table sections (Messtischblaetter) on a scale of 1:25,000 is proceeding rapidly. No less than 281 sheets of the Map of Prussia and the Thuringian States have been issued. A similar Map of Nassau, in fifty-two sheets, is in progress of publication. It is based upon surveys made in 1867-68, and revised to date. Eighteen sheets, out of a total of fifty-two, have already been issued. The general staff has likewise published a map of the environs of Kiel,† and has in hand a map of the environs of Berlin in fifty sheets.

The Geological Survey, carried on by order of the Board of Trade, is based upon the plane-table sections, of which forty-nine sheets have already been published, coloured geologically, and accompanied by explanatory memoirs and sections.‡ The first part of this survey was published in 1870, and unless its progress is accelerated, none of us will live to see it completed.

SAXONY has always occupied a prominent position with respect to its topographical maps, and the publication of its new topographical map will ensure it that rank for the future likewise. The map on a scale of 1:1000,000 having been completed in 1873,§ a new survey was at once begun, and in the course of 1875 and 1876 no less than twenty-three sheets of it were published.‖ This new map has a scale of 1:25,000; the ground is delineated by contours. There are again two editions, the one in outline, the other with the hills shaded in chalk, a most efficient and expeditious method of showing the features of the ground.

Preparations for a geological survey of Saxony, the conduct of which has been entrusted to Professor Credner, have been in progress since 1873, and the maps will be published on the same scale as the new survey.

The Topographical Atlas of BAVARIA (1:50,000, 112 sheets) was completed in 1868, and a new edition of it

* Topographische Karte des preussischen Staats, östlicher Theil, 1:100,000, 319 sheets. New edition since 1862. Sheets 1-10, 13-19, 26-32, 41-49, 62-70, 84, 86-90, 104-106, 108-110, 120, 124-128, 144-146, 167, 184, 304, 305, and 312 have been published.

The same, western portion. Sheets 258 F, 273 E and F, 287 E and D, 299 H, D and F, 310 E and D, 312 A, and 316 E, have been published.

† Karte der Umgegend von Kiel, 1:125,000. 4 sheets. Berlin, 1875.

‡ Geologische Karte von Preussen u. den Thüringischen Staaten, 1:25,000. Part 6 was issued in 1875, Part 7 in 1876.

§ The map consists of 28 sheets, and two editions were published of it, one in outline, the other with the hills engraved.

‖ Topograpische Karte von Sachsen. 156 sheets. Published 45, 46, 59-63, 75-79, 94-98, 111-116, and an Index sheet. Price 1s. a sheet, or 2s. with the hills shaded.

has been in progress since 1870. The hills on the new maps are shown much more satisfactorily than on some of the older sheets which date as far back as 1812.

The Bavarian General Staff is likewise publishing a photo-lithographed edition of 920 plane-table sections, on a scale of 1:25,000. Eighteen of these were issued in 1875.

In WURTEMBERG a new edition of the Topographical Map (1:50,000) is in progress of publication.

The Board of Works of HAMBURG has published most carefully-executed maps of the city and its territories, with contours laid down upon them at intervals of 5 feet.* Of more general interest is a map of the environs of Hamburg, on a scale of 1:50,000, published within the last few days by the same Board, and embracing a portion of Southern Holstein. Brown contours at intervals of a metre indicate the height above the sea, blue contours the depth below it.

In AUSTRIA the new topographical map of the whole of the Empire has been fairly started. It is to consist of 715 sheets, each 15 min. of latitude in height, and 30 min. of longitude in width. The scale is 1:75,000, and the map is produced by the heliographic process, which consists in transferring the original drawing upon copper, and producing an engraved plate by etching. Though only begun in 1874, no less than 151 sheets of this map have already been published, the drawing of forty-nine others has been finished, and sixty-eight were still in the draughtsmen's hands at the close of 1876. The published sheets embrace the whole of the Tyrol, Austria Proper, Salzburg, Transylvania, and the Bukowina, with parts of Galicia and Hungary. The survey, on a scale of 1:25,000, is carried on by sixteen detachments, and progresses at the rate of 2100 square miles annually. The map may, therefore, be completed in about eight years.

The special map of Hungary† is likewise making rapid progress, no less than twenty-one sheets having been published within the last two years. Two maps of the environs of Vienna are in progress of publication, one on a scale of 1:12,500 in 160 sheets, the other on a scale of 1:25,000. Of this latter six specimen sheets were published in 1876. The hills are shown by contours at intervals of 10 metres and in chalk, the roads are printed in red, the forests tinted a delicate green, and the outline and writing are in black. Of the other map of Vienna, thirty-two sheets were published and twenty-four were in the hands of the lithographers at the close of 1876.

A map of the environs of Salzburg (1:32,000) has been produced by photo-lithography, from the original plane-table sections.

The Military Institute has likewise prepared a military route map of the monarchy, in fifty sheets, carefully revised by the local authorities.‡ Two sheets of this map appeared in 1874, thirty-six sheets were published in the course of the two succeeding years, and it is expected that the whole of it will be completed in spring. An official Postal and Railway Map has likewise been published in the course of last year.§

The geological survey of the Monarchy is being carried on by four detachments under the direction of Dr. G. Stache, V. Mojsisovies, H. Wolf, and C. Paul. The latter has published a geological map of the Bukowina (Vienna, 1876), whilst the two detachments at work in the Tyrol and the neighbouring parts of Italy have inserted the geological features upon four sheets of the new map of the Empire.

The Geological Institute of Hungary has published maps of the environs of Tata, Nagy Vaszony, Sarvar, Sumeg, and Stuhlweissenburg, and a reduced edition of Hauer's well-known geological map has likewise been issued.*

The administrative map of Lower Austria, published by a private association numbering 1239 members, and accompanied by valuable statistical and topographical memoirs, is rapidly approaching completion, eighty-five out of a total of 111 sheets having been published up to the beginning of this year. The "Society for the Exploration (Landesdurchforschung) of Bohemia," is likewise continuing its useful publications. Amongst the maps recently published are a hypsometrical map of the Giant Mountains (1:100,000) and Sheet III. of the Hypsometrical Map of Bohemia (1:200,000), both by Dr. C. Koritzka.

SWITZERLAND is determined not to rest content with the laurels won by the publication of Dufour's large map, but continues the publication of a Topographical Atlas in 546 sheets, on a scale of 1:25,000 for the cultivated districts, and of 1:50,000 for barren mountain regions. Nine parts of this valuable work have been published up to the present time, containing altogether 112 sheets. Dufour's four-sheet map, on a scale of 1:250,000, has been utilized in the production of a military district and of a railway map.† Ziegler's fine map of the Engadin and Bernina (1:50,000) has already been noticed by us. It is accompanied by a memoir on the corelation between geology and topography. Nor will we allow this opportunity to escape us for again drawing attention to the fine map of Switzerland published by the Alpine Club in 1875.

The Geological Survey of Switzerland is carried on by a Committee of the Swiss Natural History Society, who receive for that purpose a small government grant, sufficient merely to cover the travelling expenses of their surveyors. Sheet 9 (St. Gall, Appenzell, &c.), by Gutzwiller, Mösch and Kaufmann, and sheet 24 (Ticino), by E. Spreafico, Negri and Stoppani, have been issued recently. Sheets 12, 13, 18, and 19 are in hand; whilst sheets, 4, 14, 17, and 23 have not yet been begun.

The Topographical Bureau of the NETHERLANDS has completed a new edition of the Topographical Map (1:50,000), as well as of the Topographical Atlas on a scale of 1:200,000.‡

The Hydrographical Map of the Netherlands (Waterstaatskaart) appears to make but little progress, only six sheets having been published in the course of 1876.

The Topographical Map of BELGIUM (1:40,000, in 75 sheets) has been in progress of publication since 1863, and about forty-six sheets have already been published, whilst the surveys for the remainder have been completed. The hills are shown by contours at intervals of 5 metres. Of the plane-table sections§ no less than 300 have been completed. These maps are printed in colours, and have contours at intervals of a metre. A road map of Belgium, recently published by the Depôt de la Guerre, supplies more information than its title promises,‖ for it shows forests and meadows, and contours at intervals of 20 metres have been inserted upon it.

No progress has been made with the Topographical Map of DENMARK on a scale of 1:80,000. The twenty-nine sheets published up to 1873 delineate the whole of

* Plan von Hamburg and Umgebung, 1:4,000. 4 sheets. Plan von Hamburg, 1:1,000. 15 sheets. Vogtei Karten, 1:4,000. Thirteen Vogteien in 19 sheets.

† Specialkarte von Ungarn, 1:144,000. 198 sheets.

‡ Militärmarschroutenkarte der öster.-ung. Monarchie. Vienna, since 1874.

§ Post und Eisenbahnkarte der öster.-ung. Monarchie, herausg. vom Post Cours Bureau. 86 sheets. Vienna, 1876.

* Hauer, Geolog. Karte von Oesterreich-Ungarno. Folio. Vienna, 1875.

† Karte der Militärkreise der Schweiz. Bern (Dalp), 1876. Officielle Eisenbahnkarte der Schweiz. Bern, 1876.

‡ Topographische Atlas van het Koningrijk der Nederlanden, Vervaardigd op het topograpisch bureau van het departement van oorlog. 20 sheets. The Hague, 1876 (first edition published in 1871).

§ Carte de Belgique ou réproduction de planchettes minutes. 1:20,000, 437 sheets. Brussels since 1866.

‖ Carte routière de Belgique. 1:160,000. 4 sheets. Brussels, 1875.

the islands, and it appears to be the intention to discontinue the publication of this map, for the new map of Jutland* is being published on double the old scale. The contours, as on the old map, are drawn at intervals of 10 feet, and there is no hill-shading to facilitate the reading of the map. The engraving is perhaps a trifle too delicate.

In SWEDEN a Topographical Map, on a scale of 1:100,000 is being published since 1866. It will consist of 102 sheets, at which forty-six have now been published. The progress made recently is very slow, for only five sheets have been published during the two years under notice. The publication of the District or Län Maps, scale 1:200,000, was stopped in 1872, after eleven läns in fifteen sheets had been published. The Agricultural and Industrial Survey of Sweden (Rikets ekonomiska kartverk) is in progress since 1859, and the whole of Central Sweden, as well as a large portion of Norbothnia, has been surveyed on a scale of 1:20,000, but as the maps are only published on the local authorities undertaking to pay the cost of lithographing them, only a portion of this work is available for public use. A general map of Sweden† is being engraved. The first sheet was published in 1870, and a second sheet is nearly ready for publication.

The Geological Survey of Sweden, under the direction of O. Torrell, E. Erdmann, and others, has resulted hitherto in the publication of sixty-two maps on a scale of 1:50,000, and of four maps on a scale of 1:200,000, accompanied by memoirs and sections.

The Topographical Map of NORWAY‡ is progressing slowly, only two sections having been published in 1875 and 1876. The map is printed in colours. The hills, where inaccessible, are drawn in chalk, whilst in the cultivated parts of the country they are shaded on Lehmann's system. Professor Th. Kjerulf has published a work on the geology of the Trondhjem Stift, with a map on a scale of 1:800,000.§

The RUSSIAN Topographical Department is engaged at present upon a new edition of the map of Poland (1:126,000, 54 sheets), with Russian nomenclature, and upon Colonel Strelbitzky's map of European Russia in 152 sheets (1:420,000), of which ninety-six have been published since 1867. Of the latter two editions are being issued, the one in black, the other printed in four colours.

(To be continued.)

VIVIEN DE ST. MARTIN'S ATLAS UNIVERSELLE.‖—Messrs. Hachette, the publishers of this work, deserve credit for having enabled M. Vivien de St. Martin, and the draughtsmen and engravers associated with him, to produce an Atlas which may fairly take rank amongst the very best works of this kind in existence. In an introductory notice to the first part of this publication M. Vivien traces the history of cartography since the days of Ortelius and Mercator. He dwells proudly upon the great services rendered by Delisle and Danville, and deplores that France should have fallen so far below what her sons achieved in former ages. He is indignant, and justly so, at the wretched maps which latterly found their way into public institutions and schools, the mere products of mercantile enterprise, directed by the lowest of motives. The Atlas now in course of publication is to regain for France the place amongst nations which she held formerly, and if we may judge from the maps now issued and of others of which we have seen proofs, this result will be achieved. The French public will now be presented, for the first time since the middle of the eighteenth century, with a set of maps embodying the results of geographical research, and creditable as work of art, to the skill and tastes of the artists employed upon it. The Atlas will consist of 112 plates, 24 by 20 inches in size. Three plates will be devoted to astronomical geography, two to physical geography, one plate to ethnography, seventy-seven plates to general and twenty-nine to historical geography. Each map will be accompanied by a memoir describing the authorities upon which it is based, and if these memoirs are written as carefully as that referring to the map of the Balkan Peninsula, they will in themselves constitute a work of no small value. The Atlas is to be published in parts containing three maps each. Only three parts are to appear annually, and twelve years must therefore pass over our heads before the work is completed. We hope the publishers will find means to accelerate this slow rate of progress.

E. G. RAVENSTEIN.

* Kaart over Jydland, 1:40,000, 131 sheets. Published in 1875-6: Gjöring, Varde, Skalling, Balkhe, Grinsted, Orre and Blaavends Huk. Total since 1870, 21 sheets.

† Topografiska Corpsens General Karta öfver Sverige. 1:1,000,000. 3 sheets.

‡ Topografisk Kaart over Kongeriget Norge (Geogr. Opmaaling) 1:100,000. 54 sheets, in four sections each. Now published 10 A, B, and D, 14 B and D, 16 C, 22 A.

§ Kjerulf (Th.), Om Trondhjems Stift Geologie. Christiania, 1875.

‖ Atlas universelle de géographie ancienne, moderne et du moyen age, construit par M. Vivien de Saint-Martin. Gravée sous la Direction de M. E. Collin. 1re Livraison: Carte du ciel; Empire ottoman (flle. du N. O.), Région arctique. Paris (Hachette), 1877.

Log Book.

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Mr. Stanley's visit to the Lukuga outlet of Tanganyika.—The *Daily Telegraph* publishes a letter from Mr. Stanley, dated Ujiji, August 7th, 1876. He appears to have arrived there in the previous June, and to have made a cruise round Lake Tanganyika during July, visiting the Lukuga outlet discovered by Commander Cameron, and examining the portion of the north-west coast of the lake hitherto unexplored. He reports that Ubwari, in the north part of the lake, is not an island but a peninsula, forming a deep bay, which he has named after Captain Burton. The following is his account of his visit to Cameron's Lukuga outlet:—

We sailed up a fine open stream-like body of water, ranging in width from 90 to 450 yards of open water. From bank to bank there was a uniform width of from 400 to 600 yards, but the sheltered bends, undisturbed by the monsoon winds, nourished dense growths of papyrus. After sailing 3 miles before the south-east wind we halted at a small bend among the papyrus plants, a few hundred yards north-west from Lumba. I then proceeded farther up the Lukuga. When about 100 yards higher we arrived at the limit of open water, and an apparently inpenetrable mass of papyrus grew from bank to bank. Here we stopped for a short time, and with a portable level tried to detect a current. The level indicated none. We then pushed our way through about 20 yards of the papyrus plants, until we were stopped by mud-banks, black as pitch, enclosing slime and puddles seething with animal life. The second day, with fifteen of the expedition, accompanied by a chief and ten of his people, we started afoot north-westwards, keeping as closely as the nature of the bushes and the watercourses would permit to the Lukuga. I observed that the trend of the watercourses and streams was from north-west to south and S.S.-East. After a march of a couple of hours we came to Elwani village, where the road from Monyis to Unguvwa and Luwe-

lezi crossed the Lukuga. From Elwani we descended by a gentle slope to the Mitwansi tract. At the base of the slope we came to the bed occupied by the Kibamiba and Lukuga. The former was a small sluggish stream with a trend south-easterly. Crossing this we came to the dried bed of a periodical river; whether it should be called the Lukuga or the Kibamiba it would be difficult to say. Prostrate and withered water-cane showed that the flow of the water in the season was lakewards. A few yards further on we reached a point where this bed first became moist, with a dense growth of water-cane flourishing and checking all progress, except by the well-trodden path, which ran through tunnels caused by the water-canes embracing above our heads. Our road lay now through what might be called a swamp, now over a firm path of dark brown clayey mud, then through shallow hollows, with water up to the ankles, which sometimes deepened to the knees. Finally we arrived in the middle of the Mitwansi, and found the water flowing indisputably westward. The stream was up to the knees and felt cold, and on putting a thermometer into it I found it to be only 68° Fah., about 7° cooler than the Lukuga Creek. By pressing the cane down with our feet to allow a free passage for the water, the flow perceptibly quickened. The average depth was about 18 inches. Trees, now dead, were seen in the centre of the bed, which proved the statement of the natives true, that not long ago the Mitwansi tract was dry enough to nourish tamarind groves. This last rainy season has changed it now, for since its termination the tract has become inundated, and a continual waterflow has been observable. The name Lukuga clings to this bed until it passes the Kiganja ridge, when the channel becomes known as the Luindi (some call it the Luimbi), which, flowing by Miketo's Land, passes through Kalumbi's in Rua, and empties into the Kamalondo, a tributary of the Lualaba.

The result of four days' experiments, investigations, and inquiries proved that as far as the south-east end of the Mitwansi tract—which may be called a marsh or an ooze, receiving and absorbing a large quantity of water from the lake, pressed against it by the daily south-east wind—there is no current, but that, on the contrary, the surplus waters, which cannot be absorbed by the already repleted ooze, on the wind subsiding, return to the lake. That for the space of two miles from the south-east end of the Mitwansi the entire bed from bank to bank is choked by immoveable mud-banks enclosing stagnant pools and stream-like expanses of water, edged round with impenetrable growths of papyrus plants. That at the third mile, where the ancient lacustrine deposit is of a firmer quality, and water-cane replaces the papyrus, there first becomes discernible an ooze, a trickle, and a flow westward, which proceeding in that direction at the base of the Kiyanja ridge, is attracted to one proper channel and presently approaches the dignity of a river, when it becomes known as the Luindi.

Mr. Stanley appears, from his map, to have gone down the Lukuga about 5 miles beyond the point reached by Cameron, where it was flowing as a river down towards the Lualaba. In the intermediate space the water, at the time of his visit, was nearly stagnant. He was about to set out from Ujiji for Nyangwe on the Lualaba.

Sir Allen Young.—We rejoice to be able to announce that Her Majesty has conferred the honour of Knighthood on Captain Allen Young, R.N.R., for the important services he performed in the Arctic Regions, during his two voyages in the 'Pandora.'

The Scurvy Committee.—The Report of and evidence taken by the Scurvy Committee will not be accessible before the second week in April; and until this is the case it would be useless to discuss the subject, or to attempt to form any conclusions. The version published by the *Sanitary Record*, and which has misled so many newspapers, is not authentic. We believe that a vast mass of useless evidence has been accumulated from witnesses who have never seen scurvy or who have never been in the Arctic Regions. All this is mere surplusage. But we shall have valuable and interesting evidence from the officers of the late Expedition, and also from the most experienced sledge-travellers of former expeditions, including McClintock, Ommanney, Richards, Hamilton, Allen Young, and Dr. Scott, the surgeon of the 'Intrepid,' in 1852-54. This evidence will fully confirm the views which we have explained in the articles in our numbers for December 1876, p. 373, and January 1877, p. 3. The absurdity of the theory that the cause of the outbreak of scurvy was solely the want of daily rations of lime-juice on the sledges is shown, not only by at least five men having been attacked with scurvy who were either never away sledging at all, or only away for a very few days, but also by the fact that the sledge-parties, which subsequently went away with regular daily rations of lime-juice, were also attacked with scurvy. If we consider that in no previous Expedition was lime-juice ever taken by sledging-parties as a daily ration, the evidence against these theorists is conclusive.

The proposed American Arctic Expedition.—In our number for February 1877 (p. 54), we published the text of a Bill to authorise and equip an expedition to the Arctic Seas, which was brought into the House of Representatives on January 8th, 1877, read twice, and referred to the Committee on naval affairs. The Committee recommended, in February, that the President should be authorised to fit out an expedition to the North Pole, and to establish a temporary colony for purposes of exploration. The scheme is one proposed by Captain H. W. Howgate (an officer in the U. S. army belonging to the signal service), who was Secretary to the Committee appointed to investigate the results of the 'Polaris' Expedition.

It is based on the idea that an open Polar Sea was seen from the 'Polaris,' beyond the northern extremity of Robeson Channel. As there was no such open sea when the English Expedition was in the same neighbourhood, in the seasons of 1875 and 1876, it is assumed that the seasons vary, and that, by patiently waiting on the spot for a few years, a season will occur when the way will be open to the Pole. It is also supposed that the entrance to Robeson Channel may easily be reached by a steamer, when in reality the approach to that channel, except under rarely-recurring and exceptional circumstances, involves the most hazardous and difficult navigation to be met with in the world. It is thought that dog-sledges could travel over the Palæocrystic Sea, another fatal mistake. Captain Howgate's proposal

is to establish a colony of fifty men with three years' provisions, at the 'Discovery's' winter quarters, to be visited by a vessel and revictualled annually. They are to have no vessel with them, but to live in a house on shore. There are also to be a number of Eskimos and dogs for sledging. Imaginary water is to be met with before the sledges of this colony reach Markham's furthest in 83° 20′ N., and boats (we are not told how they are to be conveyed towards 83° 20′ N.) are then to proceed to imaginary land in 85° N. There is to be no exploration of the coast lines, but the sole effort is to be to reach the Pole. Manual labour is not to be used in dragging the sledges, and depôts are to be formed on the floes which drift away in June. It appears that the severity of the climate in Lady Franklin Bay has been much exaggerated, and that Captain Howgate considers it not more trying than Mount Washington, in New Hampshire; and he has also discovered that men become acclimatized in Arctic service after a few years.

The Bill for an Expedition is not yet passed, and there is ample time to consider the matter. Captain Howgate's scheme is crude, and based on untenable premises. We trust that the direction of Smith Sound will not be persisted in, as no new work of any kind can possibly be achieved there; and the mere tramping over ground already discovered by the English Expedition, where careful collections in every branch of natural history have already been made, and complete series of observations taken, would be as disheartening as it would be useless. The American geographers will doubtless reconsider the matter, when all the results of the English Expedition have been worked out and are before them. They should adopt a new route where discoveries can be made and useful work done; and we are convinced that the widest and most interesting field left open in that direction would be up Jones Sound, and towards Aldrich's furthest. We have ventured to state our convictions, based on accurate information, thus plainly, because we are anxious, in the interest of geographical research, that the American Arctic Expedition should be successful in making new discoveries and achieving valuable results.

Mr. Strettell's Journey in Burma Proper.—We must draw attention to an interesting account, recently published at Rangoon, by Mr. J. W. Strettell, Deputy Conservator of Forests, of a six months' journey made by him in 1873-4 in Burma Proper, under orders from the Government of India, to report on the *Ficus elastica* there, and the best method of forming plantations thereof in British Burma. Mr. Strettell journeyed to Mandalay, and thence to Bhamo. From Bhamo he made a short excursion eastward to the Kakhyen Hills, and a more extended one northward along the Irrawaddy to Mun-tsoung (latitude 26° N.), where the river forks into two large branches, the eastern being the more important. He then returned and struck westward, making a circuit of the En-daw-gyee Lake, and returned to Bhamo in March 1874. His route coincides in part with that followed by Captain Hannay in 1835-6, and it furnishes us with much information about the nature of the Kakhyens and Shan mountaineers. Mr. Strettell found the *ficus* to extend southward as far as 25° 10′, or half a degree further than the limit assigned to its distribution by Mr. Gustav Mann. Eastward of the Irrawaddy it would appear from native report to be unknown. Mr. Strettell's work is illustrated by a map containing much new topographical information.

The Portuguese African Expedition.—The Geographical Society, recently formed at Lisbon, proposes to devote its energies more especially to the exploration of the Portuguese possessions in Africa. It has already succeeded in obtaining a government grant of 20,000*l.* for that purpose. The commission appointed for the consideration of that question leaves it to government to determine whether the object of the expedition shall be the exploration of the Portugese colonies merely, or whether an effort shall be made to penetrate into the unknown countries of the interior. It recommends the following gentlemen as members of the expedition, viz., MM. A. A. de Serpa Pinto, Cousinho d'Eça, of the navy, R. Ivens, F. B. Capello, Gastaõ Mesnier, H. Bandeira de Mello Madureira, of the navy, and A. de Brito Capello, of the Meteorological Office.

Proceedings of Geographical Societies.

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ROYAL GEOGRAPHICAL SOCIETY.

Meeting of February 12th, 1877.

SIR RUTHERFORD ALCOCK, K.C.B., President, in the Chair. The first of the three lectures, which the president announced in his Address last November were to be given during the session, was delivered this evening by General Strachey, R.E., F.R.S., the subject being "Scientific Geography." At the conclusion the president moved a vote of thanks to General Strachey for his able and instructive lecture.

Meeting of 26th February, 1877.

CENTRAL AFRICA.

The President, SIR RUTHERFORD ALCOCK, informed the meeting that the two papers about to be read referred to recent explorations in Central Africa. The first by Mr. E. D. Young, R.N., had reference to his late sojourn at Lake Nyassa, where he had the honour of launching the first steamer that had ever appeared on that lake. The second, by the Rev. Roger Price, was on a new mode of travelling in Central Africa.

Mr. E. D. YOUNG then read his paper

ON A RECENT SOJOURN AT LAKE NYASSA.

Mr. YOUNG remarked that all that had been done on Lake Nyassa was directly traceable to a determination to carry out the dearest wish of the great traveller Livingstone, who knew that to launch a steamer on that splendid inland sea, which he discovered in 1859, would do more to paralyse the appalling slave trade carried on by the Portuguese and Arabs in Eastern Africa than anything else. Livingstone's failure to convey a steamer across the falls of the Shiré, had furnished Mr. Young with an experience which enabled him to offer suggestions for another attempt, which had proved a perfect success. Since his previous visits Mr. Young found that an extraordinary flood had altered the course of the rivers Zambesi and Shiré at several points, but nothing materially interfered with his finding a convenient spot at the Kongoné mouth of the Zambesi, whereon to screw together the sections of the small steamer 'Ilala,' nor to impede her passage to the foot of the Shiré cataracts. The falls of the Shiré extend for some 75 miles, and

present the only obstacle to the passage of a small vessel from the ocean to Nyassa. After transporting the 'Ilala' across the falls, and launching her on the lake, they made their first stopping place M'Ponda's village, where they met Wakotani, one of the native lads left there by Dr. Livingstone in 1866. A number of scowling Zanzibar Arabs were also met, one of whom pointed to the badge on Mr. Young's naval cap, shaking his head as he walked off with his comrades. A number of slaves were here seen in pens; and the character that the village bore as the chief rendezvous of the slave-traders on the south border of Nyassa was fully confirmed. M'Ponda gave them free leave to settle where they chose in his territory. Leaving M'Ponda's village they soon entered the lake, and coasting along the south-west shore numerous beautiful bays and inlets were examined, and at Cape Maclear a stoppage was made to wood. Mr. Young stated that an enormous population appeared in many places in the neighbourhood of the lake, but he found that the country had been much harried by the Ma Viti, a quasi-caffre tribe, who are now active in supplying the Portuguese of Tette with captives for the special interior slave-trade, which is carried on by them on the Zambesi. Steering an E.N.E. course across the lake, they made for an Arab settlement at Loangwa, which was found to have been destroyed by war, and the occupants dispersed. They then steered back again to Cape Maclear, and finding it necessary to return to the head of the Shiré cataracts they paid M'Ponda another visit. He admitted what a great slaver he was; but pleaded in extenuation that the sale of slaves and ivory was the only means by which he could get clothes and other necessaries from the coast. Mr. Young remarked "that this simple avowal lies at the root of the whole of the East African coast slave-trade. Neither Portuguese nor Arabs will encourage any other trade. Slaves are bought with one hand, ivory with the other; the slaves carry the tusks to the coast, and there both are disposed of. Once let legitimate trade be stimulated by opening up communication by land and by water, so that the india-rubber, the metals, the gums, the cotton, the dye-woods, the ivory, the beeswax, the hard woods, which are to be had in this rich country, can be brought to ports on the coast, and the slave-trade will wither at its roots."

Mr. Young then gave an account of their journey round the lake, and the discovery of a large extension of its waters hitherto unknown.

From Cape Maclear their first stopping-place was at Makinjira's on the south-east of the lake, and proceeding northwards the grand range which towers over Chiloweela was sighted. Reaching Lesefa, which is the principal landing-place for slaves from the western shores, it was noticed that there was a sort of tacit understanding among the Arabs that the 'Ilala' was the thin end of the wedge, and that sooner or later we mean to stop the traffic on this inland sea as we had upon the ocean. Still sailing northwards they passed the islands of Likomo and Chusamoolo. In one spot Mr. Young saw, where a massacre had taken place, skeletons lying in all directions, this being the result of a slave raid on the part of the Ma Viti. It is their rule to slay every adult, without mercy, that is not fitted for the slave-market. Gales seem to come on in this inland sea without any warning, and at times are most furious; therefore Mr. Young was not surprised at Livingstone calling it the "Lake of Storms." They were now abreast of some mountains called the Livingstone Range that, amongst the parallel ranges which virtually make a mountain-basin of Lake Nyassa, exceed them all in stupendous grandeur. In no part of the world had Mr. Young seen anything to equal their peculiar magnificence. With peaks apparently 10,000 to 12,000 feet high, they ran perpendicularly down into the lake; and during the rainy season, numberless waterfalls hang upon them like threads of white floss-silk. To the Arab settlement of Kota Kota was their next cruise, which is a great exporting place for slaves, who are sent eastward. In conclusion, Mr. Young said that his expedition was a perfect success, and although the annual traffic in slaves was about 10,000, his instructions were not to interfere with it, which he considered the best policy while planting missionary stations.

The Rev. J. Mullens next read the Rev. Roger Price's paper,

On a New Route and New Mode of Travelling into Central Africa.

Mr. Price is of opinion that the difficulties of journeying into Central Africa from the east coast and the neighbourhood of Zanzibar are as formidable as may be met with in any part of the world. The distance to Tanganyika is about 700 miles, and seldom is the journey accomplished under 1000*l*. The principal difficulty to be encountered is the system of carriage. Hitherto all English travellers have been dependent upon human bearers, who by their fickleness, dishonesty, indolence, and bodily weakness have given indescribable trouble, and the loss occasioned by the outlay in wages, stolen property, and property left behind for lack of porters, has been exceedingly great. Reflecting on these things, the Directors of the London Missionary Society, when planning their expedition to Lake Tanganyika, requested Mr. Price to inquire whether a route could be found to the north of the Wanu River, on higher ground, and free from the swampy levels found here and there on the road from Bagamoyo; and also if it was possible to employ on the entire line the waggon drawn by bullocks so common in South Africa, and without risk from the tsetse-fly? On inquiry at Sadani, on the coast, Mr. Price was assured that no fly was known on the road which killed bullocks, and that cattle were frequently brought down to the coast from the interior. He therefore at once proceeded to Zanzibar to make preparations and to train bullocks, which proved no easy task, although somewhat amusing. Arriving at Sadani, the entire community turned out to see the expedition start, which included thirty men, four oxen, a riding donkey, and a cart. In nineteen stages, occupying twenty-six days, Mpwapwa, a distance of 200 miles, was reached; the return trip only occupied a fortnight, thus completing the entire journey of 400 miles in forty days. In enumerating the difficulties of this route for waggons and oxen, and the one most feared of all, the tsetse-fly, Mr. Price regards the absence of tsetse at Mpwapwa as settled, for he took the four bullocks the whole of the way, and left them at Sadani on his return in perfect health. Believing the old plans of South African travel to be perfectly applicable to these regions, the London Missionary Society are now fitting out their expedition to Lake Tanganyika on the basis suggested by Mr. Price, which it is expected will commence its march into the interior next July.

An interesting discussion followed the reading of the papers, in which the Bishop of Edinburgh, Sir Bartle Frere, Sir Samuel Baker, and others took part.

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ITALIAN GEOGRAPHICAL SOCIETY.

January 17th, 1877.—M. Boutillier de Beaumont, President of the Geographical Society of Geneva, read a paper on an initial meridian. He proposed for that purpose a meridian passing through Behring Strait. He also proposes to state the difference of longitude in hours of sixty minutes, instead of in degrees.

January 21st, 1877.—Signor M. C. Maraini in the chair. The Secretary read letters from Signor L. M. de Albertis, describing his exploration of the Fly River in New Guinea.

Capt. Camperio discussed the advantages of the Smith Sound route, and of that between Greenland and Novaya Zemlya, giving the preference to the former.

The President announced that the sum contributed by

Government, and collected privately, for defraying the expenses of the African Expedition now amounted to £6060.

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PARIS GEOGRAPHICAL SOCIETY.

February 7th, 1877.—M. LEVASSEUR in the chair. From letters read by M. MAUNOIR, the Secretary, we learn that the Abbé Charles Dallet is about to visit China, Japan, Manchuria, Tibet, and various portions of India, with a view to the collection of materials for a history of Foreign Missions; and that the Rabbi Mardokhai is preparing to leave Mogador for Timbuktu. The latter solicits the assistance of the Society, and amongst other things asks for twelve revolvers, a telescope, and a good watch.

M. BRAU DE ST. POL LIAS reports from Sumatra that he and his band of "Exploring Colonists," had been favourably received by the Dutch, and the native authorities, and that the Sultan of Deli had granted them a large plot of land on the River Bedagi, to the south of Deli, upon which they had installed themselves.

M. LARGEAU announces from Biskra his approaching departure for Tuat, and that he proposes to solicit the good offices of the Ulad Bajuda of Ain-Salah in favour of his scheme of visiting the Hoggar Country. In going to Tuat he will follow the bed of the Wed Miyah.

In a letter from Dr. PETERMANN, that geographer pressed upon France the participation in coming Arctic Expeditions, and thought that a summer-tripre commended itself most.

M. E. CORTAMBERT reported favourably on M. Lenthéric's work on the Dead Cities of the Lion Gulf (Golfe du Lion).

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February 21st, 1877.—M. E. LEVASSEUR in the chair. The secretary, M. MAUNOIR, read the correspondence received. M. LARGEAU writes that he is ready to penetrate into the interior, but is still very much in want of funds, without which success cannot be guaranteed. M. CESARE MORENO, who has passed four years in the service of the Sultan of Achin, communicates some particulars on that country. The secretary likewise reported on Dr. Holub's journey to the Zambesi, Captain Young's exploration of the Nyassa, and Mr. Bryan's scheme of Polar exploration, by means of ships and stations permanently established in a high latitude.

M. CHARLES VELAIN read a paper on the crater lakes of Nossi-bé, which abound in fish, but cannot be approached on account of the large number of voracious crocodiles.

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GEOGRAPHICAL SOCIETY OF LISBON.

AT a session of the Permanent Central Commission of Geography, held on the 9th December last, presided over by the Councillor, Jorge Cezar de Figaniere, Senor Luciano Cordeiro said that, it appearing to him necessary to issue some kind of plan, which should, however, not be considered a definite one, but simply a draft open to discussion, he would read the following:—

1st.—An expedition to be organised for scientific and commercial exploration in Central Africa, at the cost of the State, and intended—(1) to investigate the conditions of climate, configuration, production, population, communications, and topography of the territory travelled through, determining the respective geographical points, and endeavouring to obtain the best data for the geographical knowledge of unknown regions; (2) to establish commercial and friendly relations with the peopie or states it may come in contact with; (3) to rectify, when possible, the frontiers of former and present Portuguese dominions towards the interior, that is, east and west; (4) to study the means of extending the civilising and commercial action of Portugal towards the interior; (5) and finally to collect all such geographical information as may be useful to science, to commerce, and to civilisation.

2nd.—A staff to be selected for this purpose, consisting of persons who combine with the necessary physical and moral conditions, special aptitude and scientific attainments for the object in view, and experience in meteorological, astronomical, and geodesical observations.

3rd.—The expedition to be composed of six scientific explorers, and of such a staff as may be considered necessary for security and service.

4th.—The expedition shall ascend the Zaire as far as Porte da Lenha by state transport, and shall there establish its first base of operations, proceeding to explore that river in its near ramifications in boats properly prepared, and making the necessary excursions to the three arms, known by the names of Maxwell, Mamballa, and Sonho, taking the proper notes for their future laying down.

5th.—After this first essay, the expedition to be divided into two groups, composed of three scientific explorers, the senior to act as chief in each one.

6th.—One of the groups shall follow the Zaire in a N.E. direction and endeavour to strike the objective point in the Sankorra, or in the Myangowe, without losing sight of the efforts it should make to explore and accquaint itself with the water-way as far as may be possible. In the event of reaching the Sankorra, it will endeavour to study this lake and ascertain whether the Lualaba discharges into it, and the Zaire runs out of it, and, according to what information it may obtain, will continue in the direction of Lake Tanganyka, endeavouring at the same time to find out, as well as it can, the course of the Lualaba and its tributary the Lukuga.

7th.—The second group will travel south towards the interior, if possible, till it strikes the superior affluents or the falls of the Quanza and the Zambesi.

8th.—Both these groups will have the same objects of the expedition in view, as are above enunciated.

9th.—A central executive commission to be formed, subject to the previous accord and approval of the Government, of two effective fellows of the central permanent commission, and of two members of the Geographical Society of Lisbon, under the presidency of the Minister for Marine and Colonies, shall undertake to see that during the continuation of the expedition it shall not lack the means and assistance necessary, to superintend the transmission of articles it may be desirable to send out, to distribute the subsidy voted for the expedition, and arrange to receive regular communications, &c., from it.

The government will order all departments and national authorities to render the expedition the utmost aid and protection, and, after consulting such corporations as it thinks fit, will select and contract with the explorers, subject to such conditions as may be agreed upon. DUPRAT.

NOTICE.

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The Famine Districts of BOMBAY and MADRAS 1877.

One third of the crop gone. (Distressed.)
Half crop lost. (Severely distressed, bad).
Three fourths of crop lost. (Very bad).

0 50 100 150 200 Stat. M.

Cholera prevails throughout the famine districts of Madras, it is most severe in Bellary, Cuddapah, and Nellore.